"Conservation is a state of health in the land. The land consists of soil, water, plants, and animals, but health is more than a sufficiency of these components. It is a state of vigorous self renewal in each of them, and in all collectively."

- ALDO LEOPOLD

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FINDING A BALANCE

A Management Plan For Conservation & Recreation

BATES LANE CONSERVATION AREA • CROSBIE FAMILY PRESERVE • APPLETON FIELDS FARM
Prepared for the Town of Scituate MA Conservation Commission

The Conway School Winter 2013
ANNA K. M. BEST • EMILY JOY DUROST • NOAH ATLAS ZIMMERMAN

THANK YOU TO THE COMMUNITY AND CONSERVATION COMMISSION OF SCITUATE ALONG WITH THE MAXWELL TRUST. IT TAKES EVERYONE TO HELP MAKE THESE PLACES SPECIAL AND PRESERVE THEM FOR FUTURE GENERATIONS.

THANK YOU TO OUR TEACHERS FOR THEIR GUIDANCE.

CONTENTS

AVALON GRANITE LEDGE AT BATES LANE CONSERVATION AREA

EXECUTIVE SUMMARY

Ecosystem Health and Human Needs

The Conservation Commission of Scituate, Massachusetts, commissioned a management plan for conservation and recreation for 389 acres of town-owned lands known as Bates Lane Conservation Area, Crosbie Family Preserve, and Appleton Fields Farm. This report provides recommendations for preserving the ecological health of these lands and better meeting the needs of the community. Finally, the report prioritizes the steps of implementation to meet these goals.

This report uses ecological and historical evidence to demonstrate that both the ecosystem and human community are dynamic, and to argue for the importance of an active management strategy with community involvement and periodic reevaluation. Even though these properties are under the protection of conservation restrictions, their future health and usability rely on the commitment of the community and continued land stewardship.

Ecosystem Problems, Opportunities, and Recommendations

The project area invites visitors into a diverse ecosystem. Unfortunately, the forest is seeing a lack of regeneration due to deer browse, some sensitive habitats need more protection, and some non-native communities provide little habitat. New infrastructure and management policies can create a healthier ecosystem and bring more visitors to the project area. To protect rare species, only hikers should use trails through Core Habitat and dogs should be leashed. To reduce stream disturbance, bridges, boardwalks, and stepping-stones should provide dry passage over all water crossings. Hunting deer could reduce over-browsing and may help the forest regenerate. Removing non-native tree plantations and the invasive plants infesting them should provide opportunities for habitats that support both agriculture and native species.

Recreational Needs, Opportunities, and Recommendations

The project area offers a variety of trails and experiences for visitors, but some community members see problems. The land is under-utilized, access and parking are limited, way-finding can be confusing, and some visitors fear sharing the woods with hunters. The project area could be better utilized by residents of the community and region by providing a universally accessible trail segment, more access points and parking areas that are clearly designated, improved maps and signs, improved communication between hunters and neighbors, community education regarding the benefits of hunting, and a regional bike loop that connects the project area to other open spaces and Boston.

Resilience for Both Humans and Nature

These sites can offer more than just recreation; they can increase resilience. Sheltering wetlands protects community drinking water down stream. An active farm improves local food security by providing healthy vegetables, dairy, and meat to the community. Healthy forests provide habitat, sequester carbon, and produce fuels and building materials for an uncertain future.

The future health and usability of these lands rely on the continued commitment of the community.

Two public meetings were held at the Mount Hope Improvement Society in order to gather information about what the community wanted for the future of these lands and also to get feedback on initial recommendations.

First community meeting, Jan. 31, 2013.

SIGN WELCOMING VISITORS TO BATES LANE CONSERVATION AREA AT THE BEGINNING OF LITCHFIELD TRAIL

GOALS AND PROCESS

The Task

The Conservation Commission for the town of Scituate, Massachusetts, commissioned the Conway School to create a management plan for conservation and recreation for 389 acres of town-owned land, consisting of Bates Lane Conservation Area (335 acres), Crosbie Family Preserve (44 acres), and Appleton Fields Farm (10 acres). The Conservation Commission believes that the land is under-utilized, so they want to bring more visitors to the site—but they do not want to overuse or degrade the landscape. They hired the Conway School seeking a balanced, whole systems approach.

The Guiding Principles

Not all human actions affect ecosystems in healthy ways. The recommendations of this report take into consideration the needs of the community and the needs of the ecosystem; the elegant solution finds a balance between both sets of needs. Pinpointing appropriate strategies requires understanding how human and ecological needs have shifted over time, and then using that history to identify the most pressing needs in the future. This management plan for conservation and recreation may guide future stewards of the land to meet the needs of the whole ecosystem, including humans.

Finding a balance between the needs of the community and the ecosystem

THE GOALS

- **Maintain and enhance ecosystem biodiversity and resilience.**
- **Meet the recreational and safety needs of the community.**

OBJECTIVES

Provide recommendations for

- **Habitat management**
- **Visitor safety**
- **Additional recreational and educational uses**
- **Deer and tick management**
- **Access, parking, and trails**

The Planning Process

Analysis

This document first looks at ecological and human patterns at a regional and site-specific scale, presenting existing conditions, a history of the area, and met and unmet needs. This information was gathered from public meetings, written sources, maps, and field-based survey.

Various analyses are presented, including a narrative "walk along Maxwell Trail," which looks at these different patterns on the ground in the context of the project site.

Visioning

From the analyses emerged the properties' assets, problems, opportunities, and areas for protection. Where the human and ecological patterns overlap, there needs to be a plan for how they will sustainably interact. This document examines what might happen in the years to come if these lands are left with no intervention, contrasted with a future that includes active management strategies and infrastructure improvements.

Implementing management policies and infrastructure could create a better future for the land, the community, and the ecosystem. Recommendations of broad-scale policies include the management of deer populations, forestry, and education to prevent tick-borne disease. More spatially specific recommendations include harvesting the red pine plantations, protecting the Atlantic white cedar stand, and safeguarding rare species habitat. Infrastructure recommendations range from proposed new trails to access points and parking areas. The implementation of these recommendations is then prioritized according to urgency and importance as use of the land changes. The specific information to implement these recommendations is presented in the Toolbox section of this document.

A BOARDWALK WINDS THROUGH A WETLAND IN WOMPATUCK STATE PARK, PROVIDING SAFE, DRY ACCESS OVER A SENSITIVE HABITAT

A VISION FOR THE FUTURE

THESE TOWN LANDS ARE ALREADY BEAUTIFUL PLACES, BUT WHAT MIGHT HAPPEN IF THERE IS NO ACTIVE MANAGEMENT FOR THE FUTURE?

If more people do not fall in love with these lands, even in one decade stewardship could suddenly decline.

Many of the important community members who volunteer their time to maintain these lands are in their sixties and seventies. As these stewards age how will they be able to enjoy these properties with no universally accessible trails? When these stewards are gone, who will maintain the trails? Who will farm Appleton Fields? Who will guide townspeople on forest walks?

On the other hand, if there is more access for the greater community and educational opportunities, people may be inspired to take active roles as stewards. If interpretive signs share the stories of vernal pools, wolf trees, forest succession, and rare species, visitors will better grasp what it is that they are protecting. If Appleton Fields Farm has community gardens and agricultural education, visitors can learn about the importance of local food systems and healthy watersheds. A new universally accessible trail segment can give this site something that is lacking in the greater forest core, a beautiful forest path that is accessible to everyone. This new access and knowledge may inspire more visitors to volunteer their time to maintain trails and a healthy ecosystem.

If there is no management the deer population is likely to grow. Deer continuing to selectively over-browse will yield a forest lacking diversity. As old oak, beech, and hemlock trees die off, only a species-poor forest dominated by white pine will remain.

On the other hand, if the deer population is controlled, the coming decades may see a flush of rich, green and blooming plants in the forest understory; sapling oaks will be able grow into towering giants to fill the forest with nutritious acorns; multi-aged beech groves will feed game birds, song birds, foxes, turkeys, and chipmunks with their beech nuts.

If there is no management, in a couple of decades the wet places on the existing trails could widen and erode and diminish wetland habitat. This could happen even with ordinary foot traffic. Seeking a dry route, people skirt around the wet places and inadvertently widen the compacted, degraded path. Bates Lane's ruts will deepen. Litchfield Trail's wet meadow entrance will erode. Maxwell Trail skirts within inches of a stream, which will become affected by sediment freed by wayward boots. That is, if nothing is done.

On the other hand, if boardwalks and bridges are built over wet areas, visitors could observe these delicate wetland habitats without harming them. The wetlands will continue providing food, shelter, and breeding habitat for many species including box turtles, salamanders, wood frogs, and fairy shrimp. Children could lean over and watch tadpoles grow first one pair of legs, then two. These children could become important stewards of these wetlands in coming years.

One of a few vernal pools on Bates Lane Conservation Area

SCITUATE IS A SEASIDE COMMUNITY

CONTEXT

No site exists in isolation. This project area lies within a region that has been settled and intensively farmed for centuries. Since the decline of farming in the mid-1800s, the forest has regrown and people's needs are less connected with the land. People drive into the city for work and desire entertainment and recreation in or near their homes. The community that envelops this project area deeply values its forests and beaches as refuges for people and for wildlife.

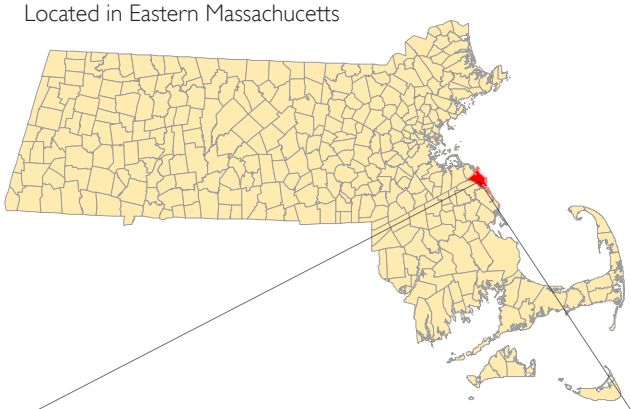
Scituate Protects Open Space

Scituate is a coastal bedroom community located approximately twenty-five miles southeast of Boston. Despite its proximity to that city, Scituate maintains strong roots in the land and the sea, conserving open space and an accessible coastline.

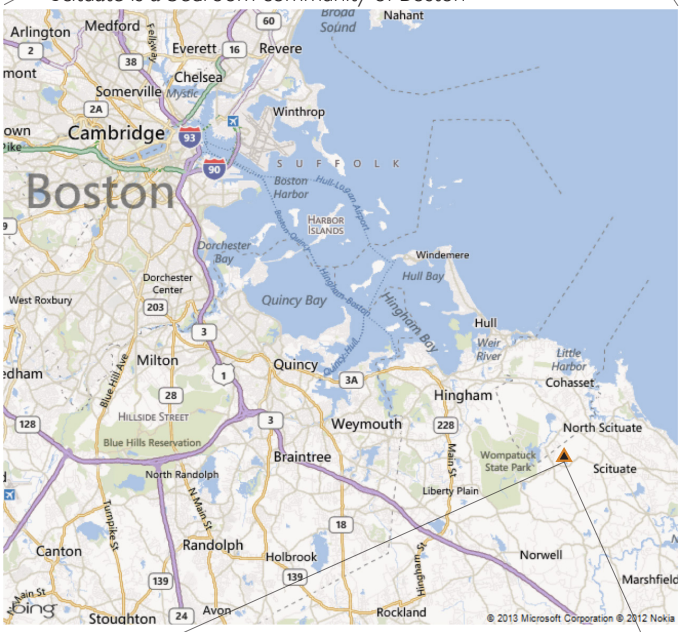
Over the almost four centuries since its incorporation in 1635, the town has grown into a community of 17,863 residents. Scituate enjoys a high employment rate, with many people in professional, management, or related fields. Eighty-five percent of Scituate's high school students go on to higher education. The median income for the town exceeds much of the region at $70,868. (Plymouth County's median income is $55,615.) Scituate's upper middle-class, well-educated populace has leisure time, and they desire recreational opportunities. A constellation of protected open spaces in the region support recreation, including the project area.

Like the rest of Massachusetts's South Shore, much of Scituate's development is concentrated along the coast. This project area lies about three miles away from the coast in Scituate's West End.

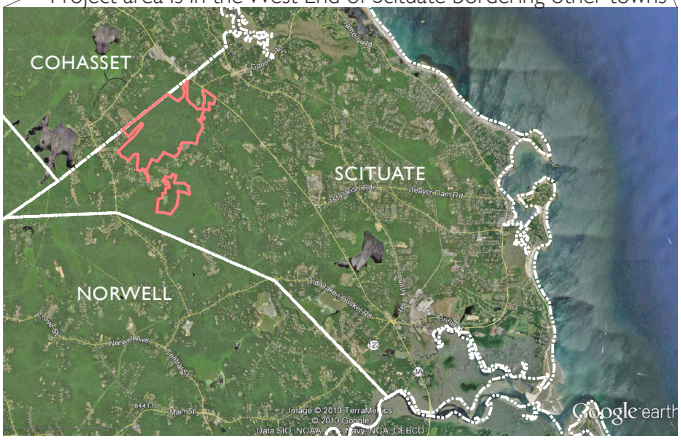
Located in Eastern Massachucetts



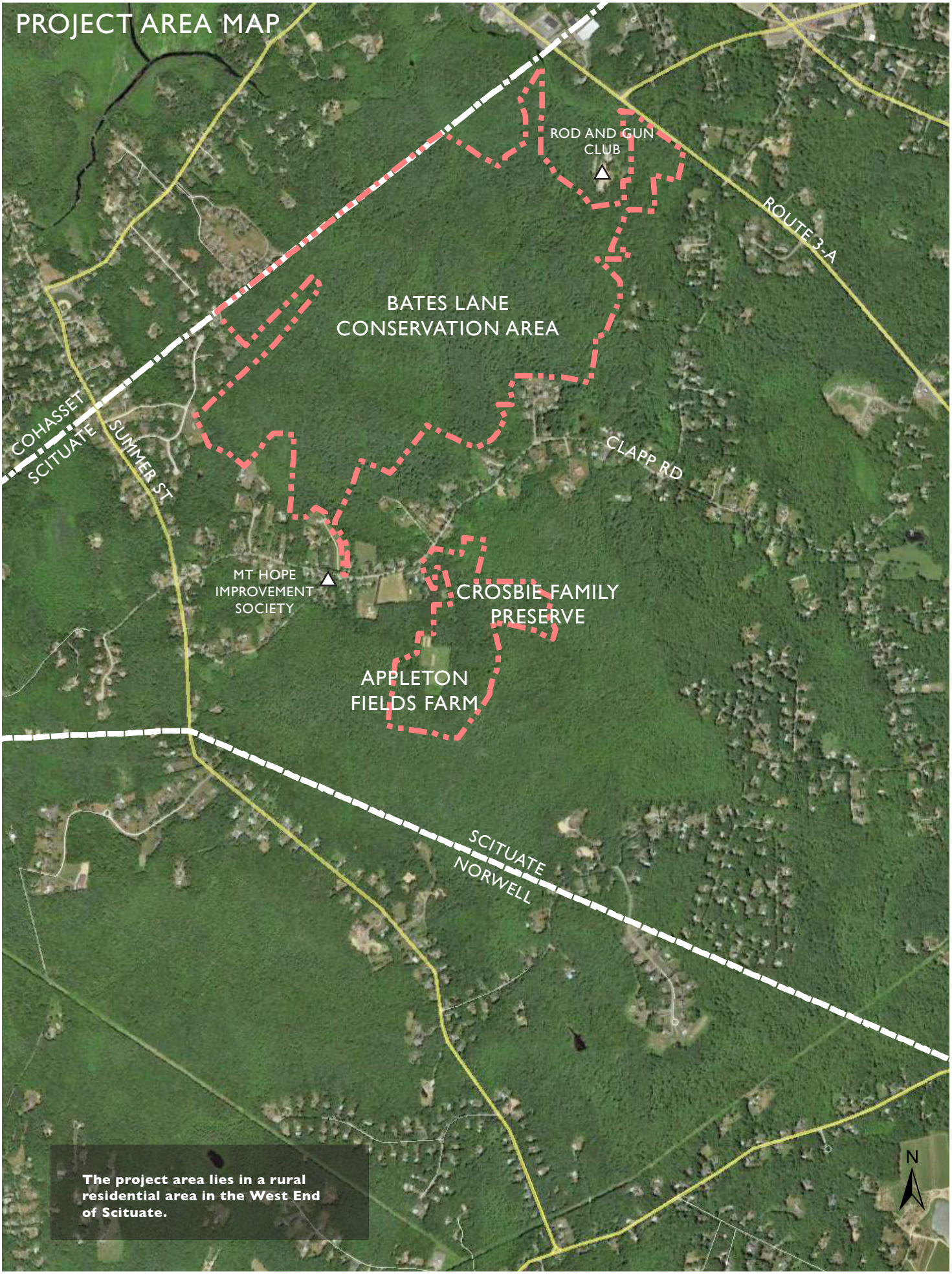
Scituate is a bedroom community of Boston



Project area is in the West End of Scituate bordering other towns



Top to bottom: MassGIS, BingMap, Google Earth/MassGIS


PROJECT AREA MAP
ROD AND GUN CLUB
ROUTE 3-A
BATES LANE CONSERVATION AREA
COHASSET
SCITUATE
SUMMER ST
CLAPP RD
MT HOPE IMPROVEMENT SOCIETY
CROSBIE FAMILY PRESERVE
APPLETON FIELDS FARM
SCITUATE
NORWELL
N
The project area lies in a rural residential area in the West End of Scituate.

West End Culture is Shifting

The West End used to be the backwoods of Scituate, where coast-dwellers kept woodlots and where rural folks lived in historical homes. Today the population of the West End is growing faster than any area in Scituate (OSRP 2009). Suburbanites are flocking there and the land is sprouting new homes. This quick development is making the protected open spaces all the more valuable to the West End community members who would like to preserve the quiet, rural character of the neighborhood.

But there is also a cultural tension building between old and new residents over the use of public lands for forestry and hunting. Generally, many long-time West Enders prefer that town lands be working landscapes for forestry, agriculture, and hunting. Generally, many relative newcomers would like town lands to remain as unaltered refuges for wildlife. Many moved to the West End for its rural feeling, but feel unsafe with hunters in the woods.

The Project Area's Forests, Farm, and Neighbors

The project area is made up of Bates Lane Conservation Area, Appleton Fields Farm, and Crosbie Family Preserve. Bates Lane Conservation Area and the Crosbie Family Preserve are entirely forested. Appleton Fields Farm includes two acres of forest and eight acres of agricultural fields hosting a small, uncertified organic vegetable farm. All three properties are under a conservation restriction held by the Maxwell Land Trust. These restrictions prevent the parcels from being developed or ecologically harmed by extraction of natural resources or destructive recreation.

The purchase of these properties was recommended by the town's 2009 Open Space and Recreation Plan. By protecting these open spaces, Scituate's Conservation Commission is protecting an important recreational destination, the rural character of its West End, and the headwaters to the town's drinking water supply. Scituate purchased the 389-acre project area piece by piece, starting with 76 acres of today's Bates Lane Conservation Area and culminating most recently with the 44 acre Crosbie Family Preserve.

Bates Lane Conservation Area lies west of Route 3A, east of Summer Street, and north of Clapp Road. It is discontinuous with the other two smaller pieces of the project area, which abut each other south of Clapp Road. Running east-west, Clapp Road and the homes along it divide the project area, making connections between the northern and southern areas difficult. However, the Mount Hope Improvement Society building lies on Clapp Road between the northern and southern parts. The Society, a stronghold of tradition in the West End neighborhood, could prove an important stewardship advocate for the project area. The Scituate Rod and Gun Club, a gathering place for local hunters on Route 3A, is another important neighbor and advocate. The rest of the properties that adjoin the project area are home to people who care deeply about the future of these lands. This is their back yard.

NEIGHBORS OF THE PROJECT AREA

Mount Hope Improvement Society

Rod and Gun Club


Rural Home along Clapp Road

A YOUNG BLACK BIRCH GROWING ON TOP OF A PARENT LOG ALONG NEW TRAIL

ECOLOGICAL PATTERNS

The project area is a forested open space near a large, protected forested area. It contains the headwaters to the town's drinking water supply, as well as rare species and natural communities. It also hosts invasive plants, problematic populations of deer and ticks, and non-native forest communities that offer little habitat value.

The project area is already protected from development, but the Town needs to know how to protect the area from visitors who may inadvertently overuse or damage the site. Protection begins with an understanding of this ecosystem and the conditions and processes that sustain it.

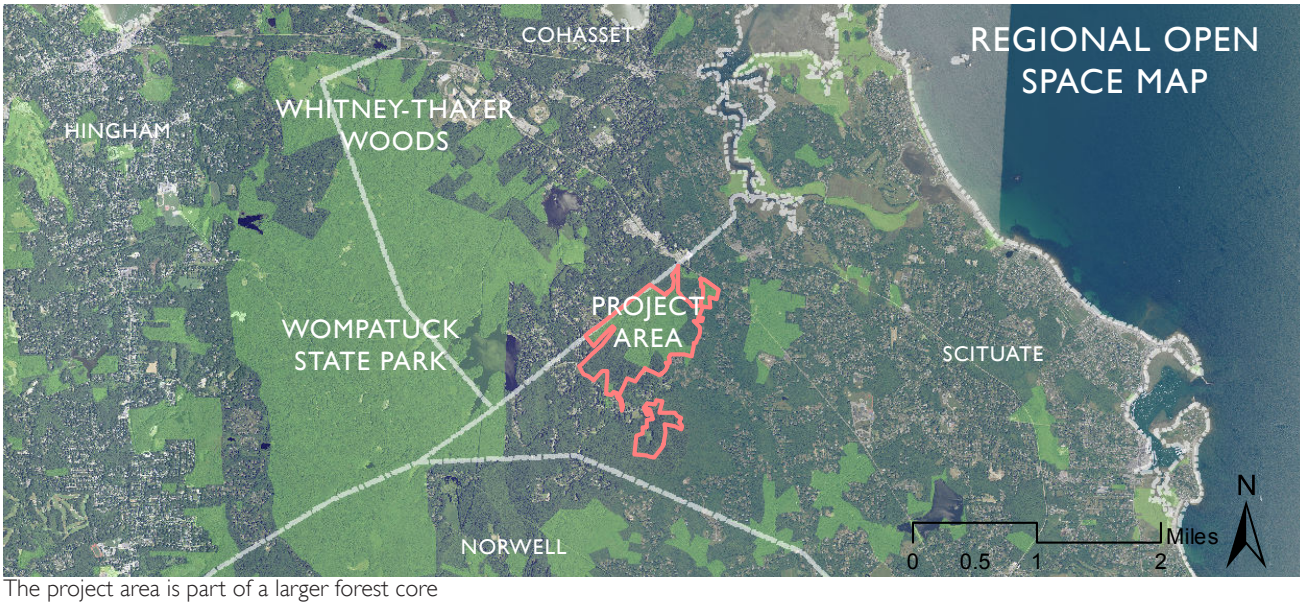
The project area's region is characterized by granite bedrock draped with glacial tills displaying beautiful rock outcrops, boulders, and wetlands. This region's forest matrix is interwoven with residential development, which is ideal habitat for booming populations of deer and ticks.

Zooming in, a majority of the project area is designated as priority habitat for wildlife. Additionally, the southwest corner of the Bates Lane Conservation Area is considered Core Habitat of rare species and natural communities. These include vernal pools, wetlands, and groves of Atlantic white cedar (*Chamaecyparis thyiodes*). In addition to natural communities there are some non-native species in the project area, such as two red pine (*Pinus resinosa*) plantations, and invasive plants found along edges of the forest and in disturbed areas. But since the town's drinking water supply lies downstream of the project area, care must be taken in controlling any unwanted plants.

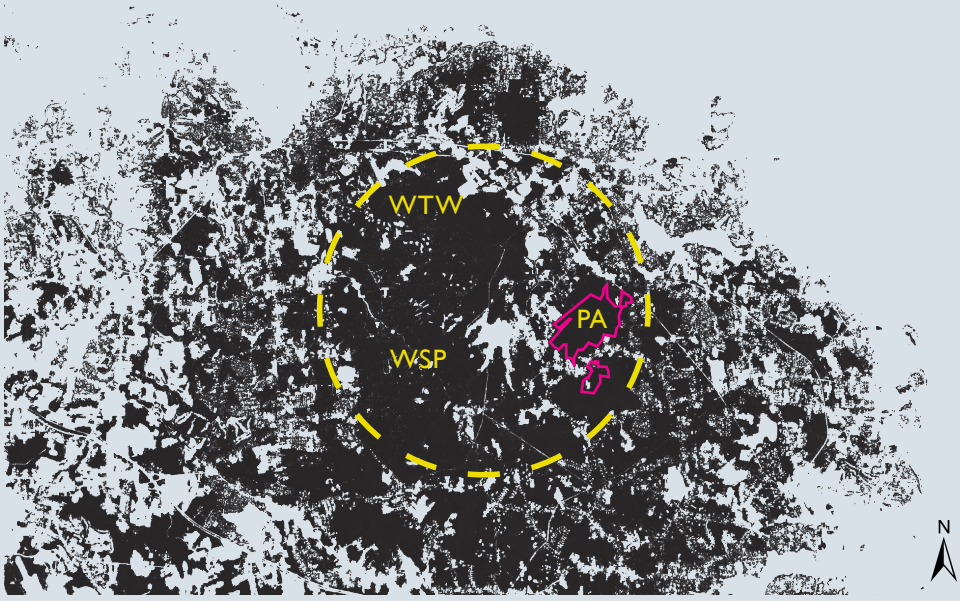
REGIONAL OPEN SPACE

There is no trail or program connection between the project area's open space and that of its larger western neighbors, Wompatuck State Park and Whitney-Thayer Woods.

Wompatuck State Park and the Whitney-Thayer Woods make up the largest contiguous forested open space in the region, with the project area only one mile to the east of these. The project area can be considered a part of this protected forest core, because, although it is not contiguous with the others, only thin corridors of roads and residences separate them. This predominantly forested landscape is important to wildlife species with large home ranges and those who require interior forest habitat, such as the scarlet tanager *(Piranga olivacea)* (Walsh 2). Scituate protects a constellation of open space parcels; however most of them are not connected with each other geographically, so migration between open spaces may be difficult for many species. The project area, a relatively large conglomerate of several open space parcels, is an exception. Wildlife and plants disperse to where conditions are best. They are not necessarily constrained by human boundaries. Regional ecological issues, such as the increasing deer population, may require regional effort and cooperation.



The project area is part of a larger forest core

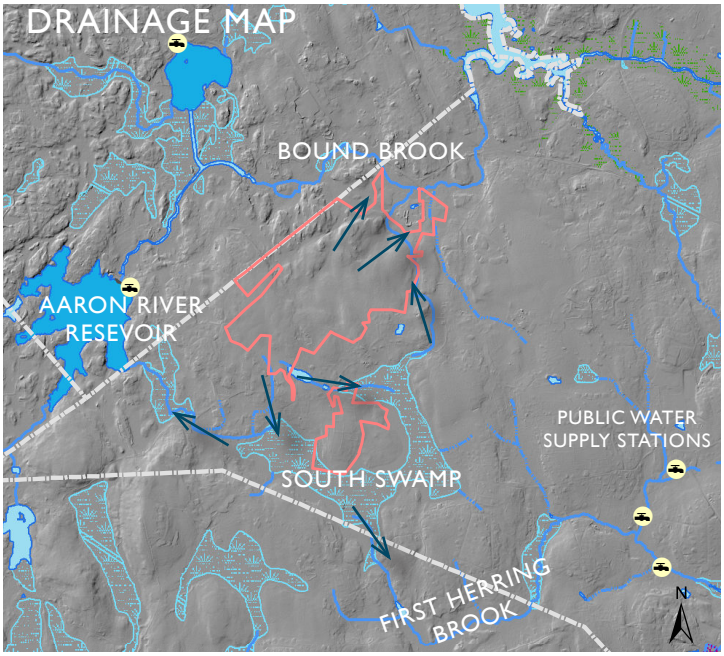


This aerial image shows tree cover in black. There is a large forest core made up of Whitney-Thayer Woods (WTW), Wompatuck State Park (WSP), the project area (PA), and several other open space parcels surrounded by development which becomes more dense further away from the core.

DRAINAGE

Water quality in the project area affects the region because these lands are the headwaters for Scituate's and Cohasset's drinking water supplies.

Like wildlife, flowing water does not respect political boundaries, and its protection requires regional coordination. Water flows in all directions from the project area headwaters, specifically into Bound Brook, Aaron River Reservoir, and the South Swamp. The latter two wetlands directly feed the municipal drinking water sources for the towns of Scituate and Cohasset (First Herring Brook and the Aaron River Reservoir respectively). Any water pollution or stream degradation on the site will have broader regional implications, both for the environment (e.g., damaged sensitive wetland habitat) and the community (e.g., polluted drinking water).

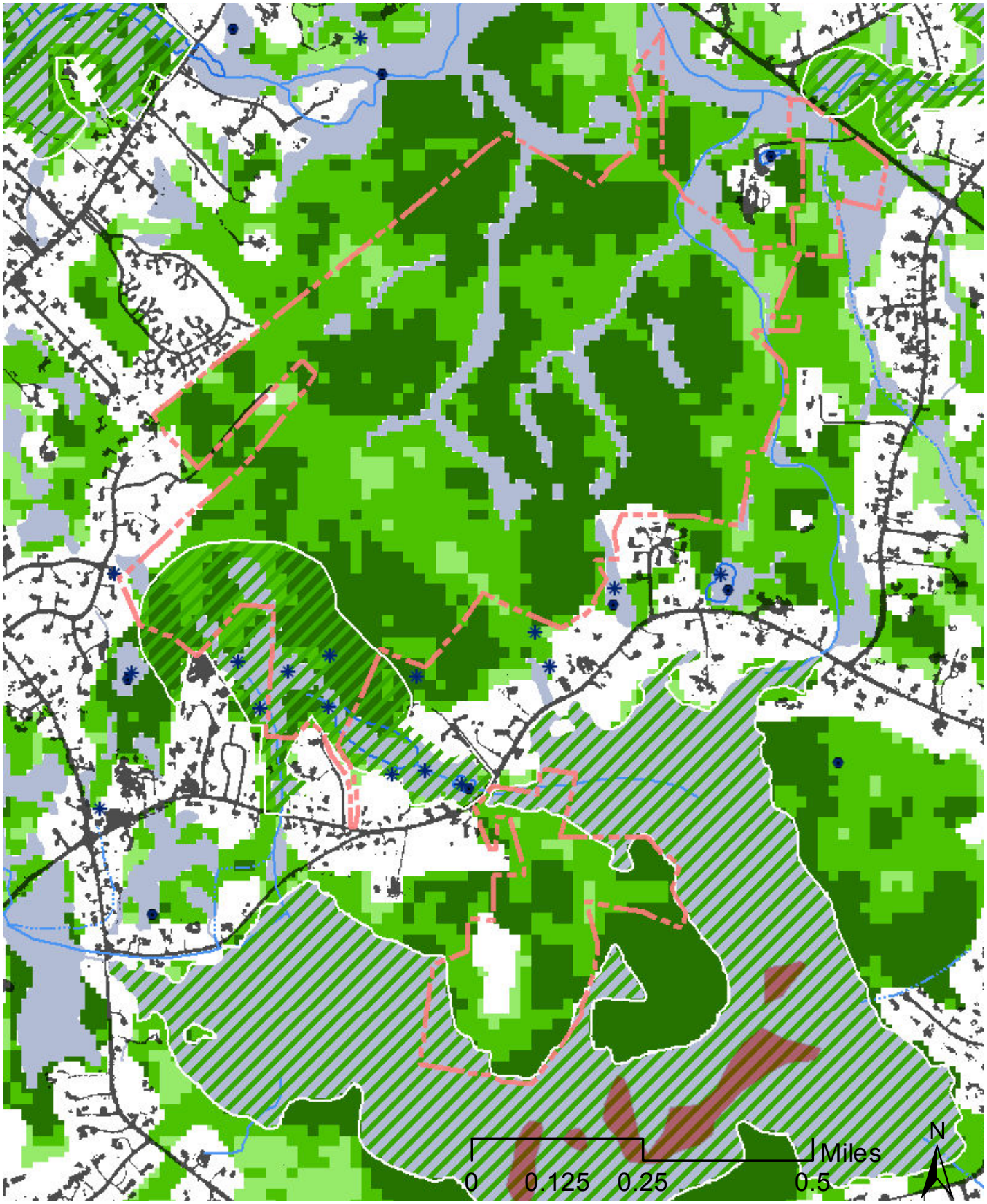


Drainage from the project area affects the region's drinking water supply.

WETLANDS

Wetlands and vernal pools provide critical habitat.

Upstream of those larger water bodies, veins of wetland traverse the Bates Lane property, and several certified and potential vernal pools dot the southwestern portion. The South Swamp surrounds the more upland Appleton Fields Farms and Crosbie Family Preserve areas. Many rare, ecologically sensitive species found in the project area require wetland and vernal pool habitat. Most notable among these species are the four-toed salamander (*Hemidactylium scutatum*), wood frog (*Rana sylvatica*), spring peeper (*Pseudacris crusifer*), fairy shrimp (*Anostaca sp.*), Atlantic white cedar (*Chamaecyparis thyoides*), and swamp dock (*Rumex verticillatus*) (Walsh 2, DFW 1).



ECOLOGICAL SUMMARY MAP

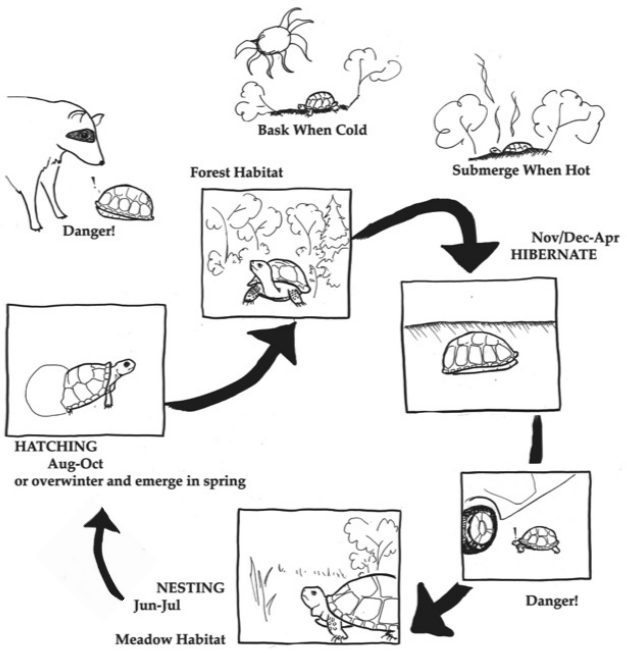
The project area is a mix of upland forests interspersed with wetlands and surrounded by rural development. Vernal pools to the west are within Core Habitat.

SENSITIVE RARE SPECIES

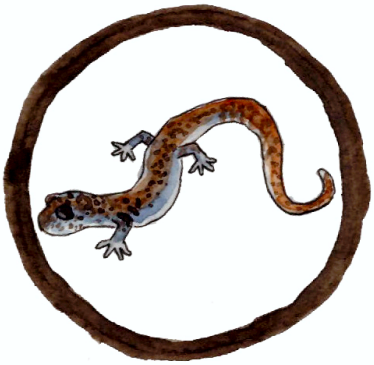
Rare species contribute to the ecological diversity and resilience of the project area.

The Massachusetts Natural Heritage and Endangered Species Program (NHESP) designates the southwestern portion of Bates Lane Conservation Area as Core Habitat, which they define as an area that is critical for the long-term persistence of rare species and diverse natural communities. NHESP recognizes four rare species in the project area, each of which depends upon wetlands: the Eastern box turtle (*Terrapine carolina*), spotted turtle (*Clemmys guttata*), four-toed salamander (*Hemidactylium scutatum*), and swamp dock (*Rumex verticillatus*) (DFW 1). These rare species may have behaviors that benefit humans; for instance, four-toed salamanders eat ticks that parasitize humans (NHESP 3). Maintaining diversity of species, including rare species, helps to bolster ecological resilience.

Eastern Box Turtle Life Map

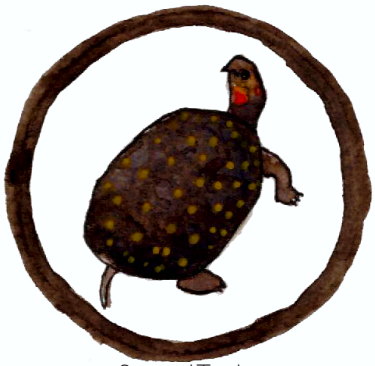


An Eastern box turtle needs both upland forest and meadow habitat during its life span. There are many dangers for the turtle because of predators and roads fragmenting habitats.



Four-toed Salamander

Eastern Box Turtle



Spotted Turtle

Swamp Dock

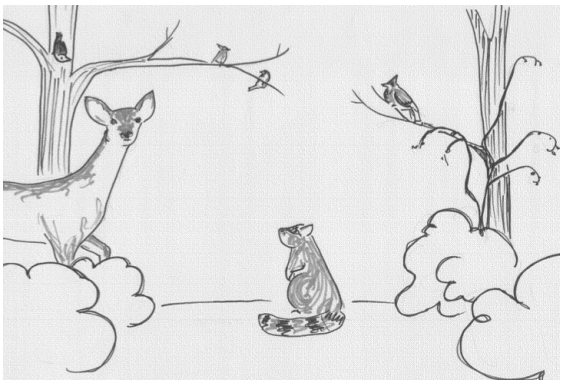
WILDLIFE

Many wildlife species rely upon the project area.

In addition to the rare species, the project area supports a wide range of wildlife. The project area is a large natural landscape block minimally impacted by development in recent history, so NHESP labels it Priority Habitat. The size of interior forest required by animals varies by species. The project area's forest is ample enough for several interior birds, but far too small for many large mammals, such as moose.

This region's forests are important breeding grounds for various migratory bird species such as the ovenbird (*Seiurus aurocapilla*), great crested flycatcher (*Myiarchus crinitus*), black and white warbler (*Mniotilta varia*), red-eyed vireo (*Vireo olivaceus*), veery (*Catharus fuscescens*), wood thrush (*Hylocichla mustelina*), and scarlet tanager (*Piranga olivacea*). The reproductive success of these interior forest breeding birds is maximized in large forest patches (how large varies by species) where there are fewer nest predators and parasites. The region also hosts many generalist mammal species, such as the short-tailed shrew (*Blarina brevicauda*), red fox (*Vulpes vulpes*), gray squirrel (*Sciurus carolinensis*), raccoon (*Procyon lotor*), and white-tailed deer (*Odocoileus virginianus*) (Walsh 2).

The ring of residential roadway around the project area limits the movement of some animals, while it poses no threat to others. Winged animals can travel easily from the project area to other forests nearby; however, animals that can only move terrestrially, such as turtles and deer, must cross hazardous roads and backyards in order to reach other forests in the region.



Generalist species have been able to flourish because of increased edge habitat as rural development fragments larger forested blocks.

FOREST COMMUNITIES

Forest composition varies from uplands to lowlands, offering diverse habitat.

Bates Lane Conservation Area has a variety of forest communities. About half of the upland forest is a mix of coniferous and hardwood trees. The other half is dominated by conifers. Veins of forested wetlands weave through the uplands.

Common in New England, these forests arose from abandoned pastures. Patches of early successional species, such as Eastern red cedar (*Juniperus virginiana*), persist in the understory as a reminder of the forest's youth.

The natural forests in the southern project area are similar. Much of the Crosbie Family Preserve is white and red pine plantations. One white pine plantation has Norway spruce in the understory. Appleton Fields' forest edges have invasive smooth blackhaw and invasive vines.

The upland forests consist of

- white pine (*Pinus strobus*)
- northern red, scarlet, and white oaks (*Quercus spp.*)
- red maple (*Acer rubrum*)
- black birch (*Betula lenta*)

Although the composition varies throughout the site, white pine is the dominant tree species, comprising 50% to 100% of the canopy cover. Understory species vary, but the most common include

- arrow-wood viburnum (*Viburnum dentatum*)
- highbush blueberry (*Vaccinium corymbosum*)
- common greenbrier (*Smilax rotundifolia*)
- white pine saplings

Common groundcover plants include

- Canada mayflower (*Maianthemum canadense*)
- tree clubmoss (*Lycopodiem obscurum*)
- partridgeberry (*Mitchella repens*)
- wild sarsaparilla (*Aralia nidicaulis*)

In the wetlands, red maple is the dominant tree species, with yellow birch (*Betula allegheniensis*), and white pine. The understory layer of the wetlands is dominated by

- highbush blueberry
- sweet pepperbush (*Clethra alnifolia*)
- arrow-wood viburnum

The wetland groundcover typically include

- a mix of wet-loving ferns
- tussock sedge (*Carex stricta*)
- sphagnum moss (*Sphagnum spp.*)

Non-native invasive species tend to remain along the forest edge or in recently disturbed areas. Species include

- common buckthorn (*Rhamnus cathartica*)
- common garlic mustard (*Alliaria officinalus*)
- multiflora rose (*Rosa multiflora*)
- Japanese barberry (*Berberis thunbergii*)
- Asiatic bittersweet (*Celastrus orbiculata*)

(Walsh 8, 15)

Atlantic white cedar stand in the South Swamp

The Atlantic white cedar stand in the South Swamp is even-aged and does not show signs of regeneration.

ATLANTIC WHITE CEDARS

Rare Atlantic white cedar stand is stable but lacks regeneration.

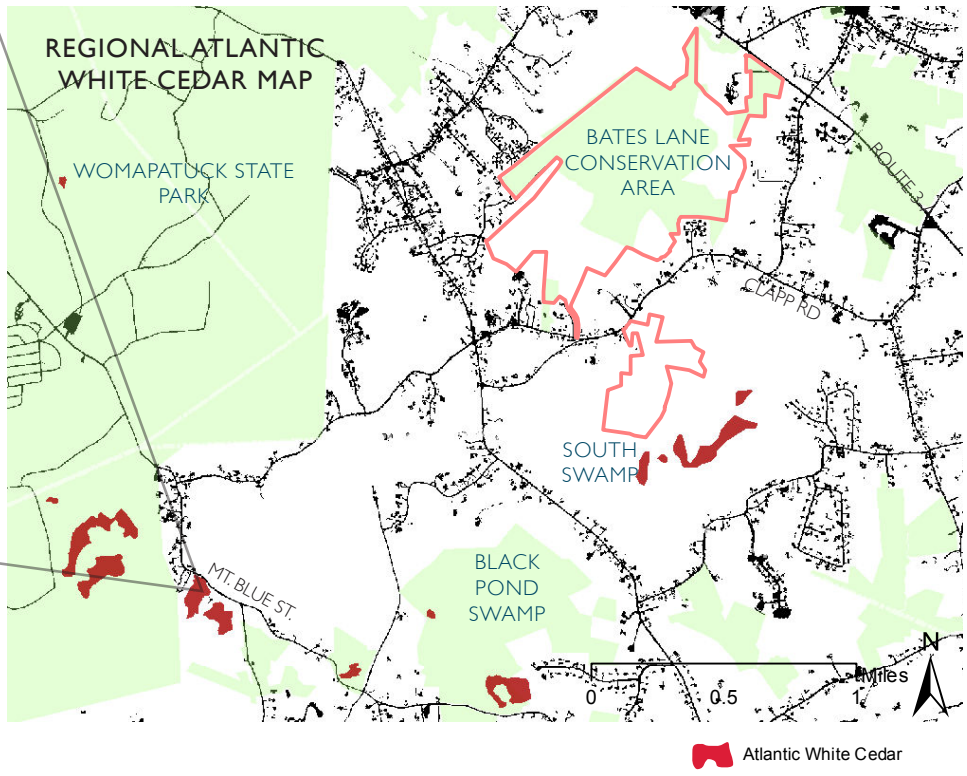
In the South Swamp just south of the project area there is a rare plant community of Atlantic white cedar (*Chamaecyparis thyoides*) which tend to host rare species such as Hessel's hairstreak butterfly ("Natural Community" 2).

This community encompasses roughly fifteen acres of even-aged cedar with no active regeneration. However, this stand is not near the height of its maturity and could reasonably persist for another fifty years at least. In addition to this particular stand, the surrounding region supports a number of other Atlantic white cedar populations that do appear to show signs of regeneration. One lies to the south and another to the southwest of the South Swamp stand.

This community type is characterized by a dominating Atlantic white cedar evergreen canopy, deciduous shrub layer, and mossy groundcover. Atlantic white cedars have strict habitat needs. They require a water-saturated peat habitat and are typically found at less than fifty feet above sea level. Their germination requires open sunlight usually acquired through major disturbances in the canopy such as blow-downs, fire, and logging. Because of this habit it is usually found in even-aged stands ("Natural Community"). The lack of cedar saplings in the South Swamp may be due to a lack of disturbance as well as the browsing of deer. Disturbance may be necessary for regeneration of these cedars.

Young stand not under protection

There are other Atlantic white cedar stands within the region that are younger and in protected open space.



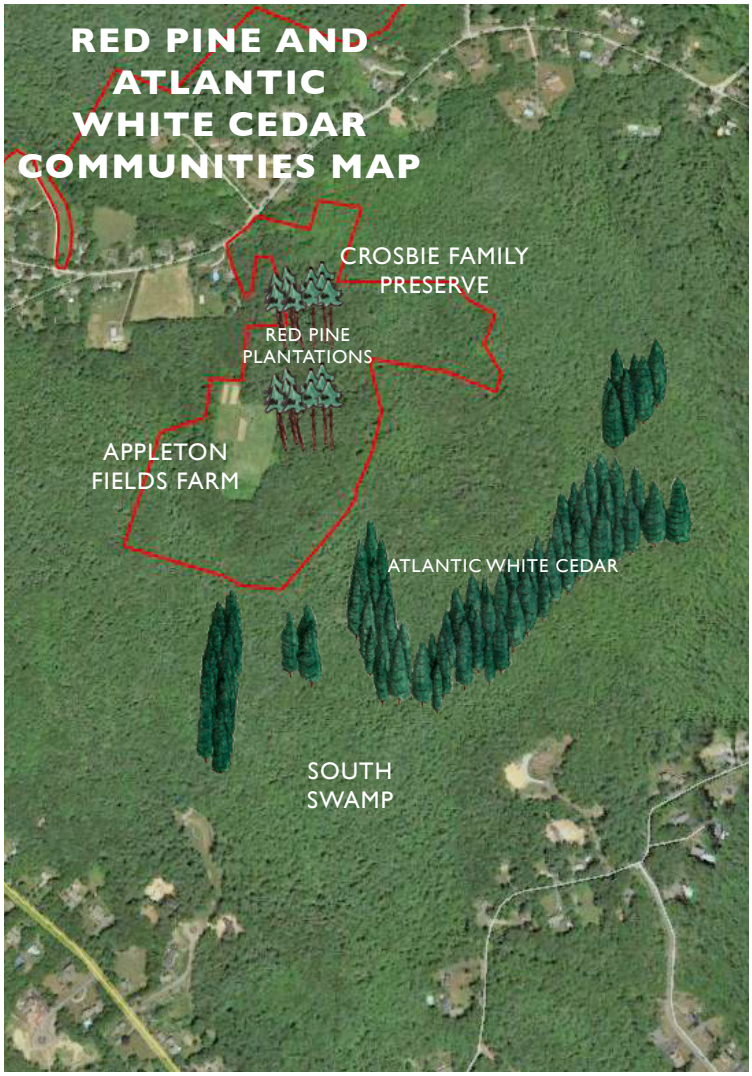
RED PINE PLANTATIONS

Infested red pines provide little habitat.

There are two plantations of red pine (*Pinus resinosa*) (2 and 1.5 acres, respectively) located on the west side of the Crosbie Family Preserve. While native to North America, this species is just south of its native range in Scituate. Many red pine plantations outside of their native range show increased health problems ("Red Pine Tree"). These two plantations were originally planted in the early 1950s when the market for red pine looked promising. They show no sign of management and most of the trees now host aggressive vines such as Asiatic bittersweet (*Celastrus orbiculatus*), Japanese honeysuckle (*Lonicera japonica*), wild grape (*Vitis riperia*), and poison ivy (*Toxicodendron radicans*), some of which parasitize the trees.

The plantations show little diversity of plant species and structure. The understory is open with few shrubs and no groundcover. This lack of food, shelter, and nesting sites limits the plantation's usefulness as habitat for wildlife. If left alone, the non-native invasive species will likely spread into the surrounding area, competing with native plant species which do provide habitat.

If the red pines die, loggers may find them less desirable to harvest for a few reasons. First, dead, rotting wood is worth little money. Second, it can be dangerous to work within a dead forest because trees may fall unexpectedly. Falling trees can also pose a risk to visitors (Motzkin).



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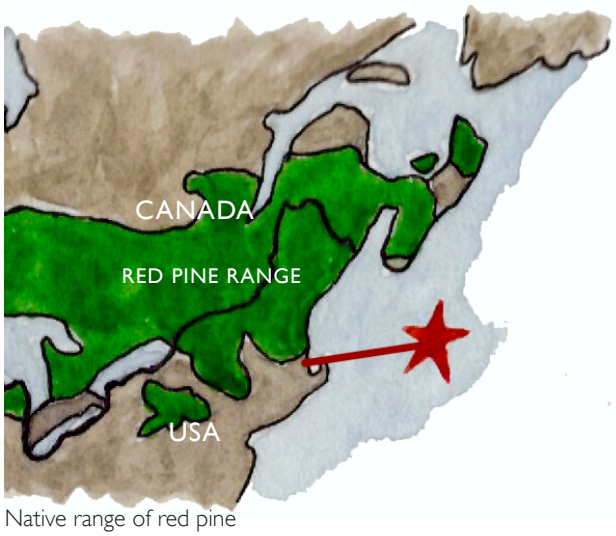


Native range of red pine

Invasive species and red pine plantation on Crosbie Family Preserve

Many red pine plantations outside their native range show increased health problems due to pests and weather.

WHITE-TAILED DEER

The too-dense deer population is causing problems for people and the ecosystem.

The project area shows signs that it cannot support more deer. In other words, it has reached its carrying capacity (Rawinski). Deer browse on the nutritious buds of saplings in winter. Their feeding kills or damages the saplings, and has been preventing the regeneration of many important forest plant species such as northern red oak (*Quercus rubra*), American beech (*Fagus grandifolia*), and Eastern hemlock (*Tsuga canadensis*). The herds in the project area browse less upon unpalatable plants such as white pine (*Pinus strobus*) and black birch (*Betula lenta*). Due to these browse patterns, the forest makeup will be skewed towards trees deer dislike. The herds also leave non-native invasive species such as Japanese barberry (*Berberis thunbergii*) untouched, giving these plants an advantage over native ones. Many other animals rely upon the oaks, beeches, and hemlocks for food and habitat. So these trees' decline threatens the diversity of the ecosystem.

The density of deer is also causing problems for the people of Scituate. Deer browse on many ornamental plants and vegetable gardens, damaging expensive and work-intensive landscapes. The herds also cause property damage and endanger human lives by crossing roads and causing collisions. The police report that deer strikes are especially frequent on Route 3A, which borders the project area.

Deer have reached their
Cultural Carrying Capacity

Definition: "maximum number of deer that can coexist compatibly with local human populations" (Ellingwood and Spignesi 42-45).

Browsing on landscape plants

Deer-car collisions on Route 3-A

Deer have reached their
Biological Carrying Capacity

Definition: "number of deer that a given parcel [of land] can support in good physical condition" ("An Evaluation" 5)

Deer are preventing regeneration of certain forest species by browsing on saplings.

The Deer Population's Turbulent History

The white-tailed deer has seen a rapid population increase in recent years, following a turbulent past. With the disappearance of its historical predators such as Native Americans, Eastern timber wolves (*Canis lupus lycaon*) and mountain lions (*Puma concolor*), followed by a drastic deforestation and reforestation of the landscape, deer populations have been on a roller coaster since Europeans settled in New England. Due to over-hunting and agricultural deforestation by settlers, deer populations plummeted. By the early 1900s, there were estimated to be fewer than 1000 deer in the state of Massachusetts ("White-tailed Deer").

Since then, however, the landscape has shifted to forested suburban areas and fragmented woodlands interspersed with larger forested open spaces where deer prefer to feed. With the reintroduction of usable habitat, deer populations skyrocketed to where they are today — 85,000 to 95,000 across the state ("Deer Hunting" par.2). In the absence of wolves and mountain lions, humans are the only predator deer have left. Unfortunately, Massachusetts has fifty percent fewer hunters than it did twenty years ago (Richmond).

The Division of Fisheries and Wildlife manage deer population within Massachusetts by zones, and Scituate lies in Zone 11. The population density goal for white-tailed deer in Zone 11 is six to eight deer per square mile (Christensen). Southeastern Massachusetts' deer population density exceeds the goal at approximately twenty-three to twenty-five deer per square mile (Dunn, Lepore, and Spock 12).

Massachusetts' developed landscape is excellent deer habitat. White-tailed deer prefer forest edge habitats where they are close to forage in the fields and shelter and breeding grounds in the forest. An individual deer's home range varies from one half to three square miles, depending on the season, and they will move beyond this range when food becomes scarce. Deer are not generally restricted by development. They often cross roads and human boundaries such as parcel, town, and county lines ("Living with Wildlife" 3). So management strategies can be ineffective if they fail to consider the greater region.

TICK-BORNE DISEASE

The significant threat of Lyme disease keeps people out of the forest.

In addition to damaging forest ecosystems, deer also host the ticks that carry Lyme disease. Incidence of Lyme disease and the population of deer show a direct correlation (Christensen). Scituate has an elevated incidence of Lyme disease. Plymouth County, in which Scituate lies, was ranked in 2011 as having the second most confirmed Lyme cases in the state of Massachusetts (Vakhshoorzadeh et al.). Fear of contracting the disease prevents many people from venturing into the forest where the ticks are most common.

Lyme Disease and the Tick Lifecycle

Lyme disease is caused by the Borrellia burgdoferi bacterium, which is transmitted to humans via infected ticks. Tick species from the *Ixodes* genus pass on the bacterium when they attach themselves to a host's skin and feed. The most common vector species in this region is the deer tick (Ixodes scapularis). A tick becomes infected as a larva when it attaches to an infected host (usually small mammal or bird species). As the tick matures, both the nymphs and adults will attach to larger mammal species such as deer or humans. The nymphs cause a majority of human Lyme disease cases since their small bodies go unnoticed. A larger adult tick may be infected but may not remain attached long enough to pass on Lyme disease ("Deer Tick Ecology").

Remnants of a firepit on Teepee Rock

The risk of fire in the project area is considered low. If there is one, it will most likely be caused by humans.

County*	2011Confirmed Cases (#)	2011 Incidence Rate (per 100,000)
Barnstable	168	78
Berkshire	120	92
Bristol	152	28
Dukes	34	206
Essex	227	31
Franklin	52	73
Hampden	119	26
Hampshire	86	54
Middlesex	361	24
Nantucket	39	383
Norfolk	213	32
Plymouth	335	68
Suffolk	61	8
Worcester	188	24
Unknown	496	--
State Total	**2,651**	**40**

(Vakhshoorzadeh et al.)

Plymouth county had the second most confirmed cases of Lyme disease in the state of Massachusetts in 2011.

FOREST FIRE

The risk of fire in the project area is low.

Any time rural residences surround a large forested landscape the dangers of forest fires need to be considered. Community members expressed worry about campfires getting out of control in the project area. However, field biologists suggest that this site is not under high threat of fire. Tree and shrub species on the site are not fire-prone, and neither are the soils. The veins of wetlands would discourage movement of understory fires. Bates Lane can serve as a fire road if necessary. It is possible, however, that if climatic conditions change (e.g., longer or more severe droughts) the risk of fire may increase.

In New England, most forest fires are caused accidentally by humans. Lightning ignites few forest fires in this region. Most lightning storms here are accompanied by rain and occur during summer when moisture-filled leaves are on the trees, discouraging any flames. When they do occur, fires in springtime tend to be the highest threat to human life and property because the forest litter is dry, winds speeds are higher, and there are no leaves on the trees yet.

1831 MAP

In 1831 there was little to no forest cover on the project area except where it enters the South Swamp, here shown as the Town Swamp.

HUMAN PATTERNS

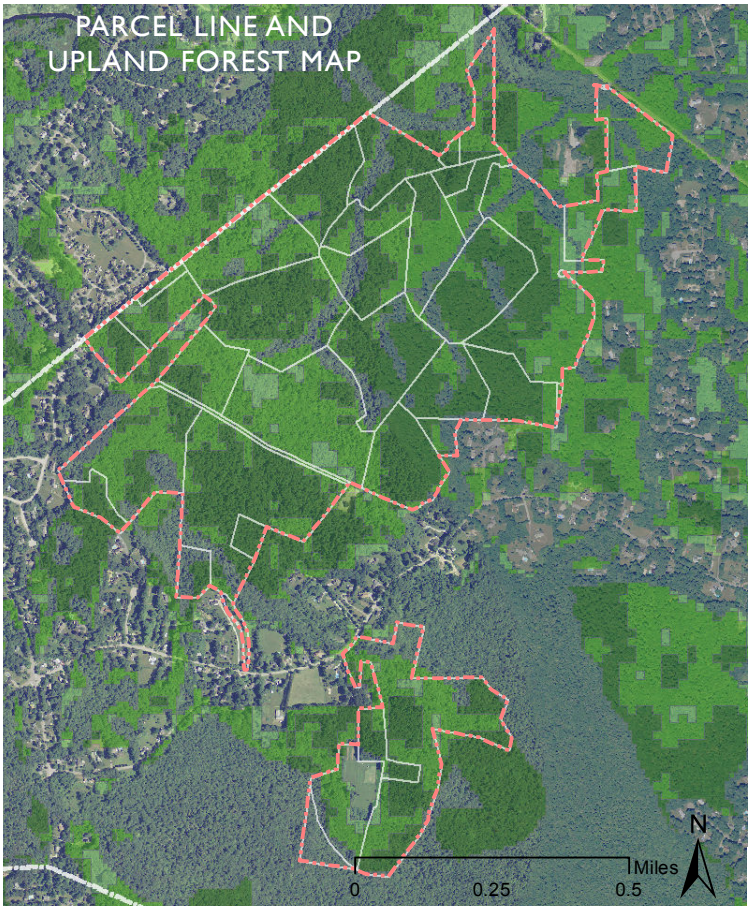
Patterns on the ground reflect the current and past human uses of these sites including development, access, recreation, hunting, and agriculture. The story of these lands is dynamic and ever changing.

The Bates Lane Conservation Area, Appleton Fields Farm, and Crosbie Family Preserve have been purchased parcel by parcel over the last decade and still reflect a history of cleared pasturelands and woodlots with rock walls delineating boundaries. These sites are now protected against encroaching rural development, and form part of a larger protected forest core mostly comprising Wompatuck State Park and Whitney-Thayer Woods.

The project area is currently used for passive recreational activities, hunting, and agriculture. Access to the properties is limited to two official access points at Bates Lane and Litchfield Trail, but many neighbors access the sites from their backyards on unofficial trails. Each of the two access points is served by a temporary, off-site parking area across Clapp Road.

From these two lots there are a variety of trails that offer differing experiences. But people with limited mobility may find some sloped and wet areas on trails inaccessible. Universally accessible trails are lacking in neighboring Wompatuck State Park and Whitney-Thayer Woods.

Visitors who feel safe and comfortable on the site are more likely to return regularly. However, some community members said that they do not feel safe in the woods with hunters present. Hunters want to continue to hunt on the land. This conflict between the right to hunt and the right to feel safe continues to cause tension within the community.



The project area has been purchased parcel by parcel over the last decade and represents a past land use history of woodlots and pasture land. As well as rock walls and cart paths, the forest communities correlate with parcel lines.

Rock wall on project area

A HISTORY OF LAND USE CAN STILL BE SEEN ON BATES LANE TODAY WITH SUCCESSIONAL HARDWOODS TO THE LEFT AND OLD-FIELD WHITE PINES TO THE RIGHT

THE HISTORY OF THE PROJECT AREA BROADLY REFLECTS THAT OF THE REGION.

Landscape dioramas built by the Harvard Forest tell the story of how people have changed the central New England landscape since European settlement. (Dates are approximate.)

Pre-settlement Period (1500)

- A stratified forest with a diversity of ages caused by
  - Natural disturbances such as wind and ice storms, pathogens, lightning-induced fires, and beaver-induced flooding
  - Native American disturbances such as clearing trees for settlements and burning the forest to improve conditions for hunting

First Settlement Period (1640)

- Settlers begin to clear small homesteads and create a domesticated rural landscape
- Several mills constructed on the First Herring Brook
- Expansion of settlement towards western highlands, including today's Bates Lane Conservation Area
- Economy sustained largely by development of fishing, shipbuilding, and mill industries

Agricultural Period (1830-1880)

- Peak of agriculture and deforestation
- Scituate's most prosperous period
  - Town exceeds Plymouth both in property value and in population
  - Peak of shipbuilding on the North River and Scituate Harbor
- In 1831 there was little to no forest cover on today's project area, except where it enters the South Swamp

Early Industrial Period (mid-1800s to mid-1900s)

- Farming declines
- Many pastures revert to white-pine-dominated forest because pines grow quickly in full sunlight
- Shipbuilding declines because the depth of Scituate's North River cannot accomodate the demand for larger ships

White Pine Forest (1910)

- A market for white pine wood grows
- Many of the old-field white pine stands are cut for lumber
- Many of these century-old white pines persist today on the Bates Lane Conservation Area

Succession of Hardwoods (1915-1930)

- After the clearing of old-field white pines, hardwoods are able to succeed due to their ability to sprout from their stumps and roots in full sunlight

Scituate history taken from *MHC Reconnaissance Survey Town Report*

Harvard Forest Dioramas

The project area's forest has a dynamic history of disturbance and is not a "pristine" natural site

Humans have been managing the landscape for centuries. The public may more readily support a sustainable forest management plan if they understand that this land is not pristine. This ecological narrative can also be shared with the community, so that people can understand and appreciate landscape features such as old stone walls, massive trees, and young hardwood stands. Looking into past development and disturbances may also help in planning for the future as old trails are rediscovered and historically disturbed sites turn into destinations.

REGIONAL DEVELOPMENT PATTERNS

Rural residential development runs along unprotected upland areas.

The forest core region is characterized by a matrix of undeveloped forest made up of uplands interspersed by wetlands. Surrounding and dividing this forest core are upland roads connecting corridors of upland rural development. The upland parcels of Bates Lane Conservation Area were under threat of development before the Town purchased them to protect the headwaters of its drinking water supply. Protecting these lands does not aim to stop development in the town but instead to guide it towards higher density settlements, protecting larger unfragmented habitats.

REGIONAL CONNECTIVITY

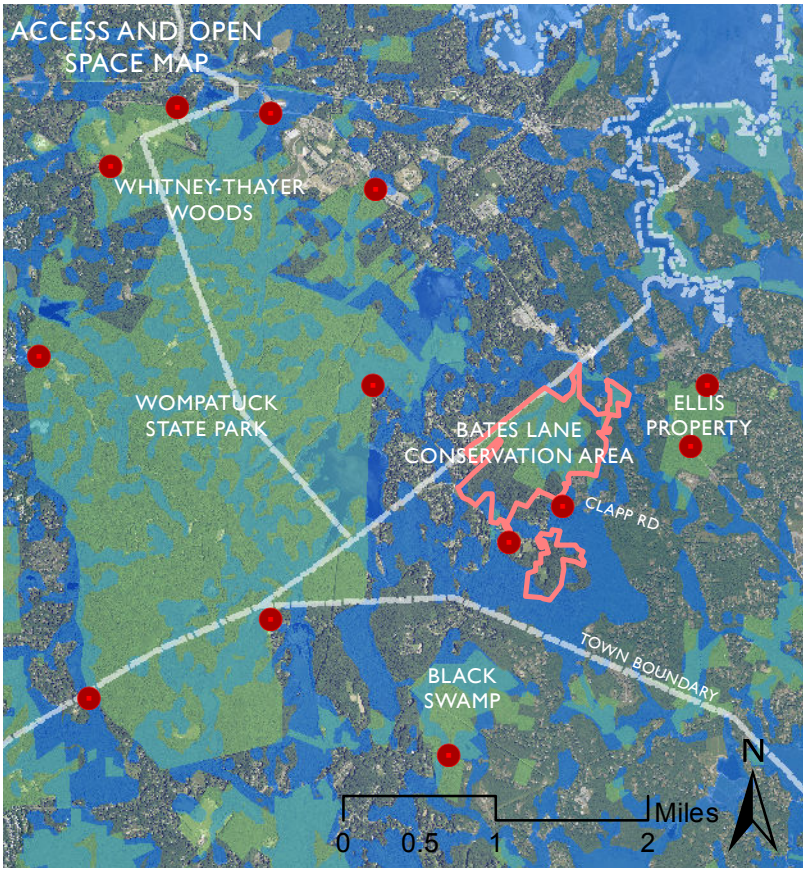
While the region supports a large amount of public space, the various areas are not managed cooperatively.

There is not currently any recreational connection between the project area, Whitney-Thayer Woods, and Wompatuck State Park even though there are roads and access points. Coordinated recreation might better serve the community.

REGIONAL LAND AND RECREATIONAL USES

While hosting a wide range of recreational activities, the nearby open spaces lack universally accessible walking trails.

Gaps in recreational opportunities highlight unmet needs. For example, a couple of miles northwest of the project area, Whitney-Thayer Woods of The Trustees of Reservations has a farm, meadow, and forest. Things to do there include farm education, hiking, dog walking, biking, horseback riding, and cross-country skiing on ten miles of trails. One mile to the west of the project area, Wompatuck State Park is a forested old ammunition depot with ponds that offers camping, biking, fishing, hiking, horseback riding, boating, and cross-country skiing. There are twelve miles of paved trails for biking and many more unpaved for hiking. There is no universally accessible trail within either of these publically accessible open spaces, despite the fact that an in-holding property at Whitney-Thayer Woods is a retirement home ("Whitney and Thayer", "Wompatuck").



The regionally protected open space keeps certain uplands from being developed and offers a variety of recreational opportunities, except universally accessible forest trails. Access points surround Wompatuck and Whitney-Thayer but not Bates Lane Conservation Area.

Access point at Whitney-Thayer Woods

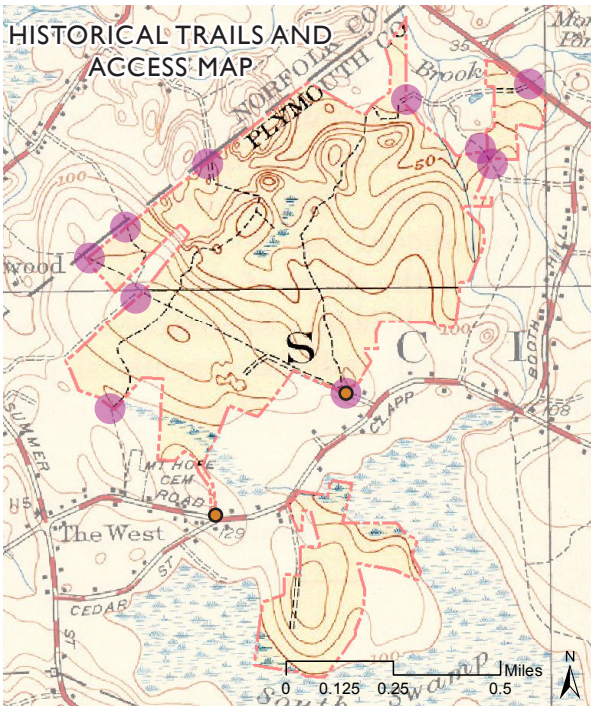
Protected Open Space
Access Point
Wetland

ACCESS AND PARKING

The project area can be accessed from two designated trailheads but lacks official, on-site parking.

In 1943 there were ten mapped access points into all sides of Bates Lane Preserve. Now only two official access points remain and they are located on the south side. It may be difficult for many people to access the Bates Lane Conservation Area from anywhere but Clapp Road. The two access points have unofficial, off-site parking lots nearby. The Conservation Commission would like to build an on-site parking area at the Bates Lane Conservation Area.

Currently the only access into Appleton Fields and Crosbie Family Preserve requires trespassing on an abutter's property. To solve this, the Conservation Commission plans to build a driveway from Clapp Road into the Crosbie-Appleton lands and a parking lot.



In 1948 there were ten access points into the Bates Lane Conservation Area, and now there are only two, located off of Clapp Rd. There were also historical trails, only two of which still exist today: Carl Pipes Trail and Bates Lane.

WAY-FINDING

Current signs and way-finding strategies do not do enough to inform and properly direct visitors.

To inspire people to explore these unfamiliar settings they must have reassurance about finding their way. But some signs in the Bates Lane Conservation Area are confusing. The only kiosk is at the Litchfield trailhead, but it provides no way-finding information. A rough trail map is posted at every trail intersection, but it shows no information about the trails' length, difficulty, or special features. The trails are clearly blazed with color-coded markers that match the trail map. A sign on Clapp Road directs visitors with an arrow toward "Carl Pipes Memorial Trail," but that is only one of seven trails. Only a sign announcing hunting marks every entrance into the project area. The hunting sign is wordy and confusing; it may make visitors feel nervous rather than comfortable.

At Appleton Fields Farm a kiosk marks entry into the field, but it only contains the hunting sign. The Appleton and Crosbie lands do not display any other signs, because trails and access have not yet been established.

As opposed to the narrow forest trails, Bates Lane is wide and flat with a long line-of-sight ahead and into the adjacent woods. It is a comfortable option for first-time visitors or those who feel timid in the woods. The other trails have curves, slopes, and trailside vegetation that reduce visibility. People who may feel nervous about sharing the forest with strangers and wildlife may feel less comfortable on these trails (Kaplan, Kaplan, and Ryan).

Moving through the property there are many signs of human activity. Wetland flagging, litter, abandoned tree stands, and signs of vandalism can give the visitor a sense of uncertainty and uneasiness, whereas rock walls and trail markers represent pride and caring for the land, which can give the visitor confidence and a sense of safety. Positive signs of human activity and clear way-finding are important to the sensory experience of any user.

Trail map at Bates Lane Area

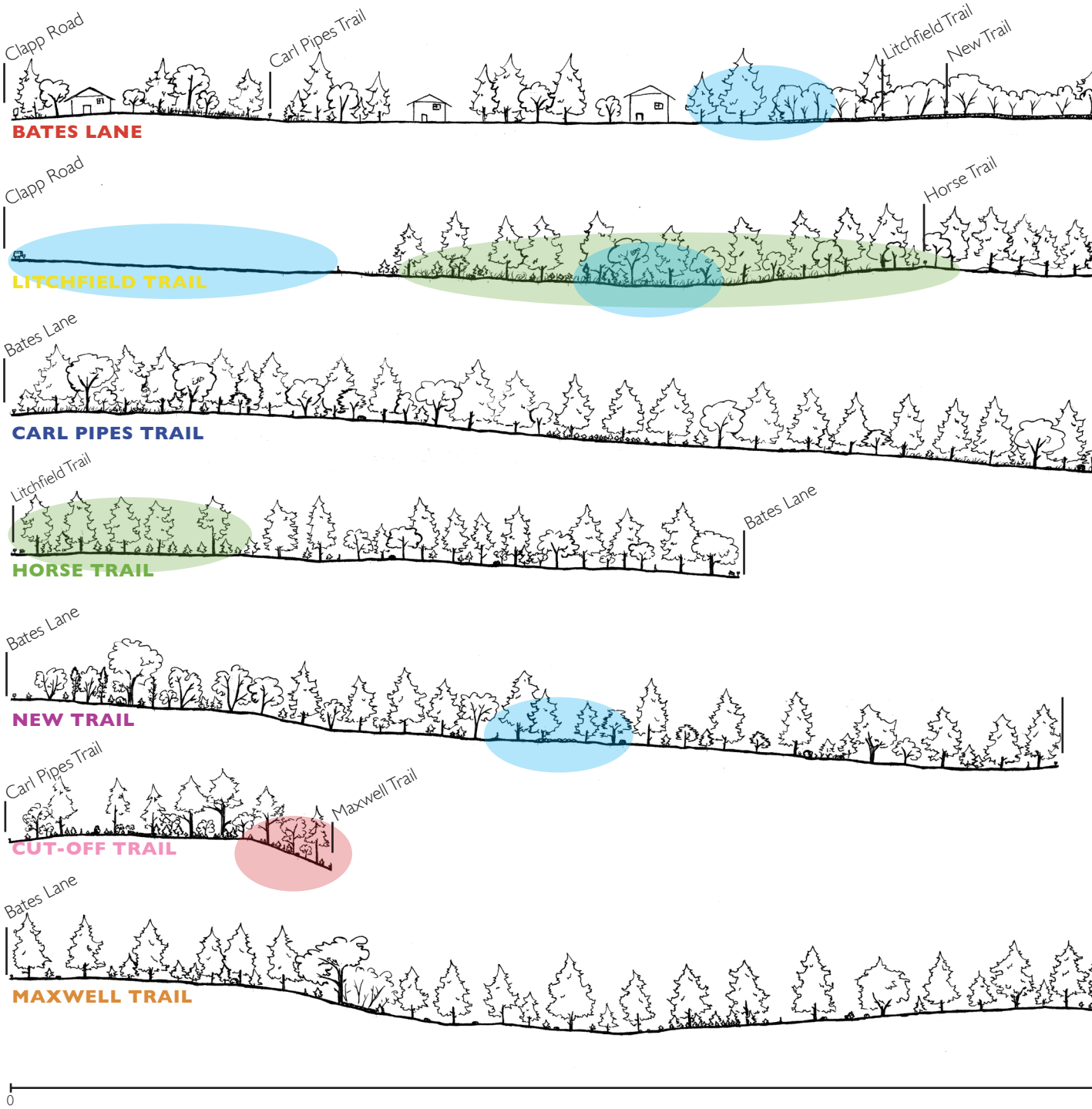
Current maps may not sufficiently inform vistors about different trails.

TRAILS

Along the trail system of the Bates Lane Conservation Area, there are a wide variety of trail experiences but only one destination spot. Crosbie-Appleton lands lack trails.

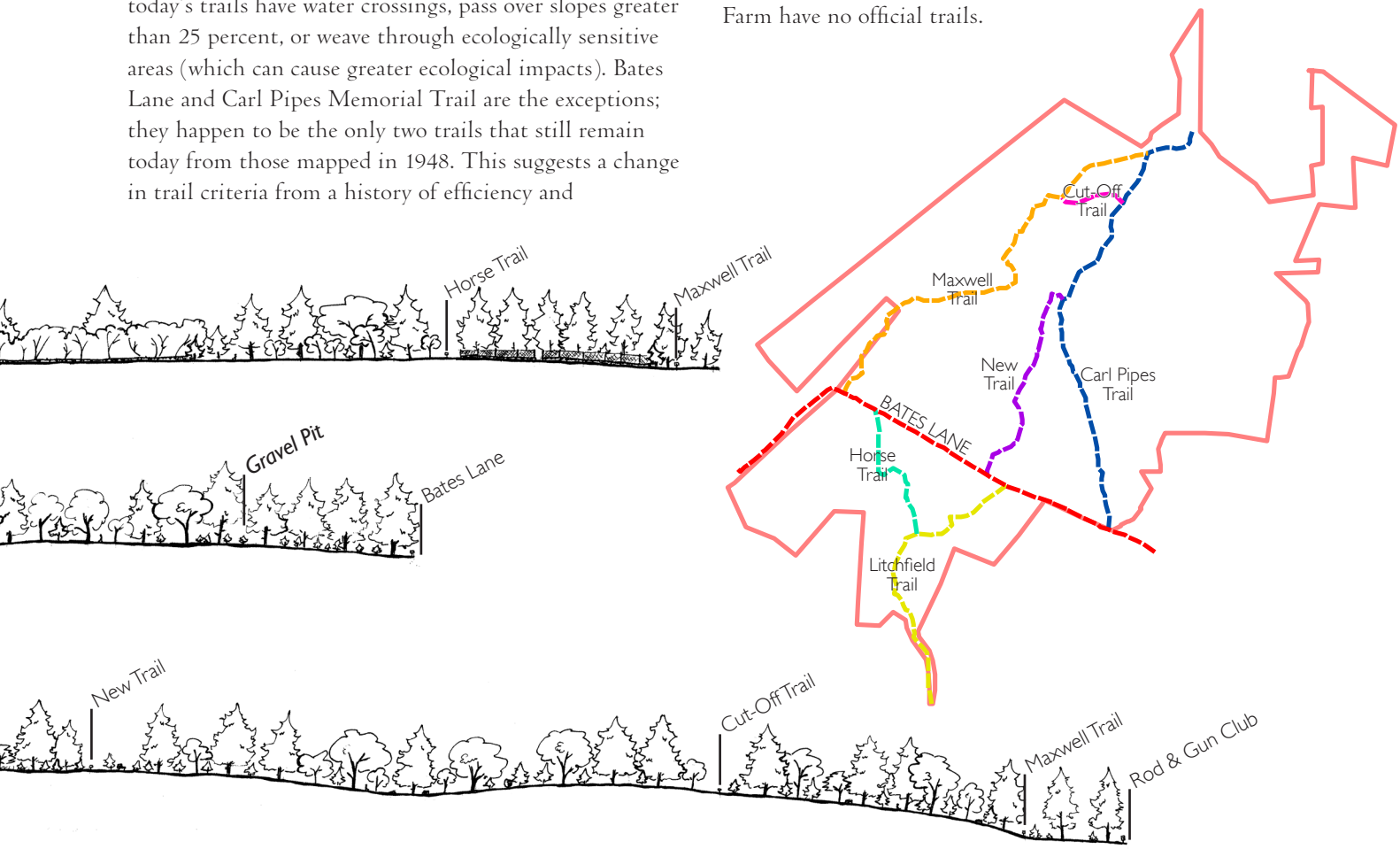
On the Bates Lane Conservation Area there are about 3.7 miles of trails that radiate off Bates Lane, an old unpaved road. The trails traverse a variety of beautiful habitats but rarely reach any distinct destination. Somewhat uncomfortable benches have been placed along trails throughout the site, allowing visitors to rest their feet but not necessarily enjoy their location. While many would not consider it strenuous, Maxwell Trail is one of the longest trails at 0.78 miles and crosses slopes of 25 percent and therefore it may be inaccessible to people with limited mobility. At the same time it hosts the only trail-side destination point with a bench: the Teepee Rock overlook. Other potential stopping points along trails, like large boulders or the gravel pit merely have a spur trail to reach them and lack built places to sit.

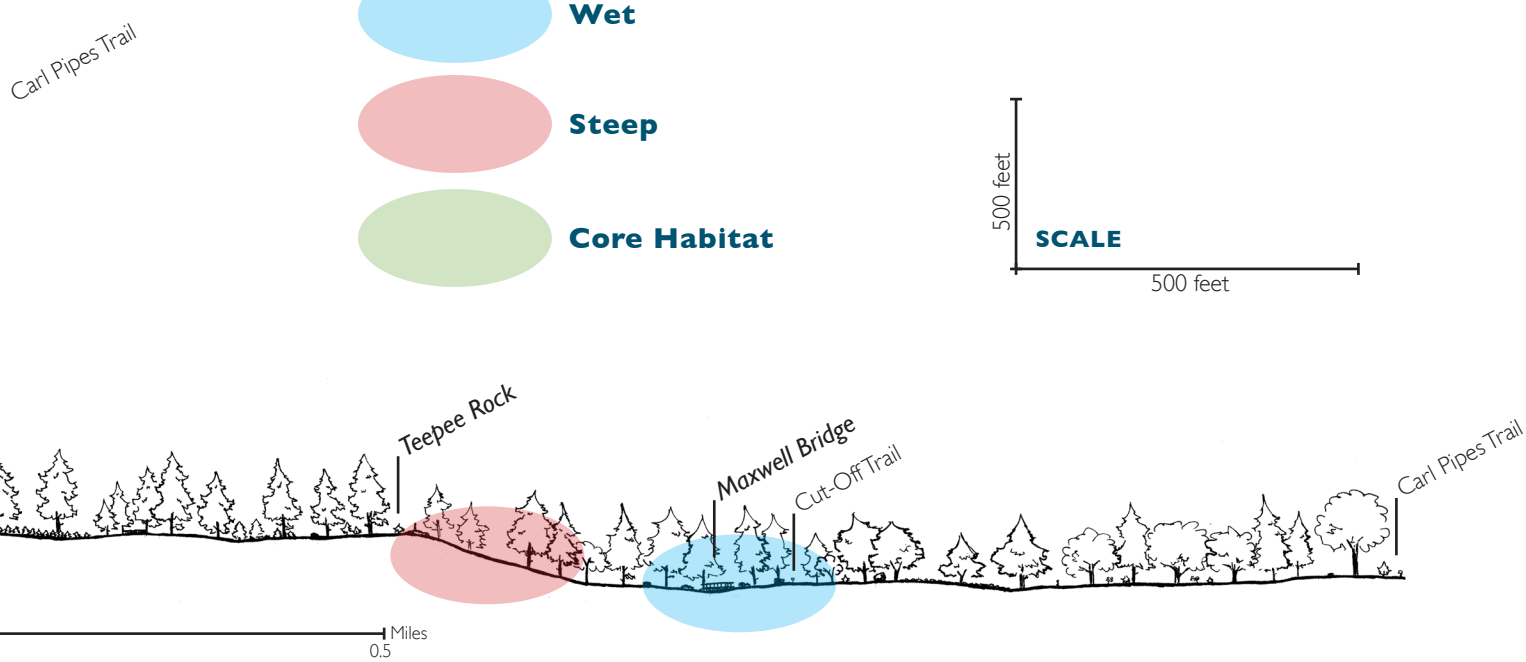
Thanks to volunteer efforts, the trails appear to be generally in good condition. Exceptions include some rutted, muddy areas at the beginning of Bates Lane, a soggy meadow and stream crossing on Litchfield Trail, and a few other areas of water crossings and frequent ponding. These ruts may worsen or sensitive habitats become disturbed if appropriate crossings are not built.



A USGS topographic map from 1948 shows more trails on Bates Lane Conservation Area, and Bates Lane itself was used to access a gravel pit. Today the gravel pit is an attractive, unique landmark with a history of disturbance. The trails present in 1948 consistently ran on relatively flat and dry uplands. In contrast, many of today's trails have water crossings, pass over slopes greater than 25 percent, or weave through ecologically sensitive areas (which can cause greater ecological impacts). Bates Lane and Carl Pipes Memorial Trail are the exceptions; they happen to be the only two trails that still remain today from those mapped in 1948. This suggests a change in trail criteria from a history of efficiency and practicality to a present state of discovery and adventure, reflecting the changing needs of the community. Today people desire recreation, relaxation, and inspiration. These trails can serve to educate and excite stewardship for the future of these lands and others like them.

The Crosbie Family Preserve and Appleton Fields Farm have no official trails.





HUNTING

The project area serves as a regional hunting ground but some community members would like hunting banned.

As mentioned in Ecological Patterns, the deer population has exceeded the region's carrying capacity. Massachusetts Department of Fisheries and Wildlife believes traditional deer hunting is an effective and economical management strategy for meeting deer density goals. They set hunting seasons, bag limits, and antlerless deer permits in order to meet the density goal. The state and local bylaws mandate that

- First-time hunters or license buyers are required to take the Basic Hunter Education Course
- No hunting is allowed within 500 feet of a building or within 150 feet of a paved road
- No hunting is allowed on Sundays
- No discharge of firearms allowed east of Route 3A

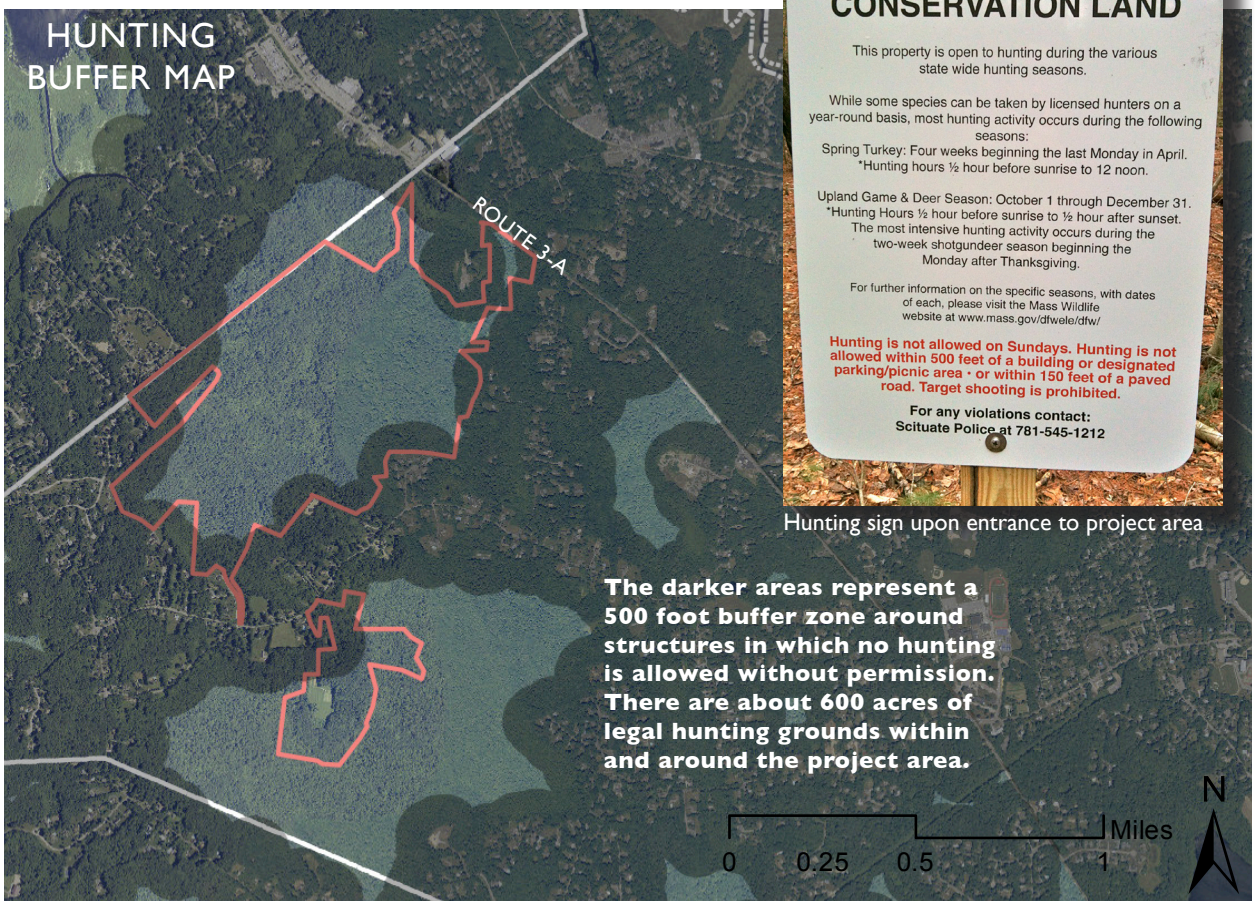
These rules still allow for nearly 600 acres of lawful hunting grounds in and around the project area. In spite of the buffer keeping hunters away from homes, homeowners have complained of property damage from stray bullets from the Bates Lane Conservation Area.

Within much of the regional forest core hunting is restricted or prohibited due to the building buffer. In Wompatuck State Park small game hunting is restricted to a designated wildlife management area and no deer hunting is allowed anywhere on property. In Whitney-Thayer Woods restricted bow hunting is allowed only by permission of the superintendent. These local restrictions are likely pushing more hunters into the Bates Lane Conservation Area where there are only state restrictions.

Many community members expressed fear of being in or near the woods during hunting season. Some local people do not trust the hunters because they are strangers; they are either not from the Scituate community or their social circles do not mingle.

Current hunting signs at entrances may confuse visitors and worsen their fear. The lengthy, unintuitive signs say that hunting is allowed all year long but is more intensive at certain times. The signs do not encourage any specific safety precautions such as wearing bright orange or putting a bell on your dog. Despite the confusion and discomfort, there have been no known hunting injuries on these lands.

Hunting sign upon entrance to project area



FARMING

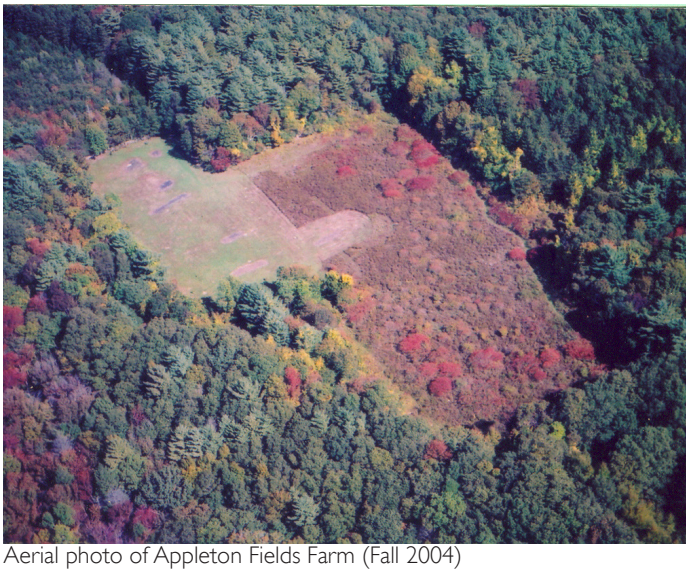
Appleton Fields is one of few small organic farms left in the region.

Appleton Fields Farm is located on soils that are designated prime farmland by Natural Resources Conservation Service. As interest in farming has dissipated in the region, much of the prime farmland has become developed or forested. This farm is rare and regionally important.

The Appleton Farm abuts the South Swamp. Since the swamp is the headwaters of the Scituate public water supply, it is vitally important to not pollute these waters. The current farmer uses organic practices, mulches extensively to conserve water and prevent weeds, and uses pigs to clear the fields of stones and stumps naturally. His farming methods grow healthy food and do little harm to the ecosystem. More intensive practices, such as chemical applications, heavy water usage, and large-scale equipment, could negatively affect the town's water supply.

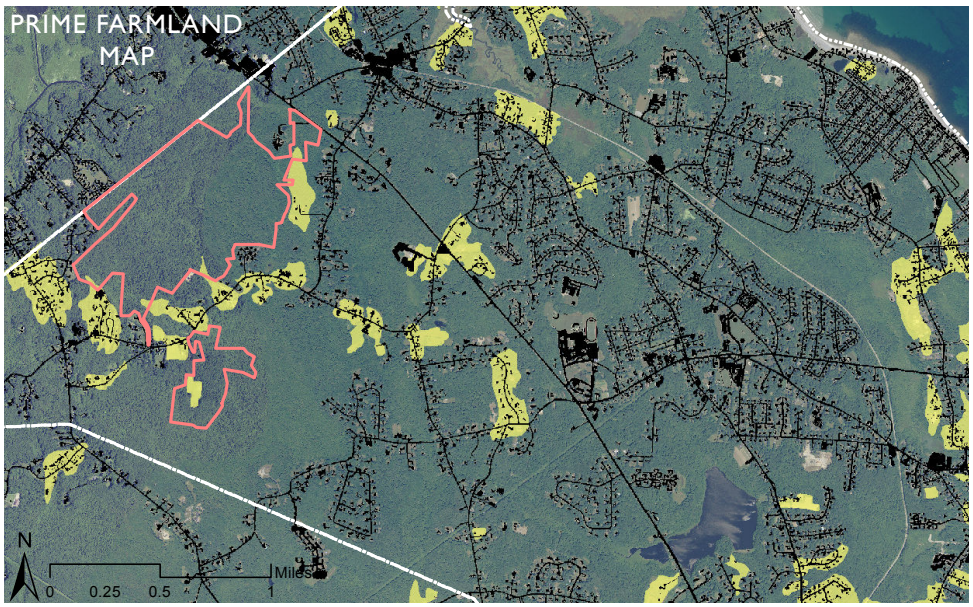
The current farmer cleared 3.5 acres of fields for agricultural use, but can only manage a quarter acre of vegetable garden on his own. Ninety-three percent of the Appleton farmland is going unused, but he is preparing it for crops in hopes that more farmers will become involved.

Maintaining sources of local, organic food production, such as Appleton Fields Farm, can help make a community more resilient by strengthening the local economy and food security. Farming also offers many opportunities for education about food systems, healthy diets, and gardening in a time when many people are losing touch with where their food comes from. Such education is being done nearby at Weir River Farm at Whitney-Thayer Woods.



Aerial photo of Appleton Fields Farm (Fall 2004)

Educational activities at the farm



Most of the prime farmland within Scituate has been developed or is forested, making Appleton Fields Farm both unique and important.

Farm to School officials visit Appleton

Prime Farmland

A mixed forest of deciduous and coniferous trees provides diverse habitat.

A WALK DOWN MAXWELL TRAIL

In order to see what ecological and human patterns look like, let's take a walk down the Maxwell Trail from north to south. We'll move through different habitats, from a mixed forest to a pine-dominated forest, and from a wetland to an overlook. This is just one trail of seven, but many of the patterns we see on the Maxwell Trail are representative of the rest of the site.

Mature Forest with Hardwood and White Pine Trees

What there is to see:

Starting at the northern end on a flat stretch of trail, the canopy is diverse. Mature oak, beech, and red maple trees allow large patches of sunlight to warm the forest floor in winter, and their seeds scatter on the ground. The leaf litter underfoot is a mixture of broadleaves and needles. Huge white pines cast patches of shade and shift in the breeze. Along the trail we see signs of birds, deer, and coyote, among others.

What is missing:

This forest floor lacks hardwood saplings. Those present are scarred or dead. The beech sprouts are multi-trunked and disfigured from browsing. The population density of white-tailed deer is higher than the forest can sustain. The deer are eating the oak, beech, and maple saplings as quickly as they can sprout. This mature canopy of hardwood trees looks beautiful now—but as they die few, if any, young hardwoods will be available to replace them.

Why are beech root sprouts a good indicator of deer population?

According to Tom Rawinski of the USDA Forest Service, the saplings that sprout from the roots of mature beech trees are an excellent indicator of deer population density. Tree saplings that arise from seeds possess only the amount of energy contained within the seed, plus the energy from any sunlight they receive on the forest floor. In a forest with a dense canopy, not much sunlight reaches the ground for these seedlings, so few of them survive.

Beech trees are special because they reproduce by sending up sprouts from their roots. Each of those sprouts (also known as suckers) has access to plenty of energy because it is a part of the parent tree that already has a place in the sunlit canopy. So, without interference, these beech sprouts should be able to thrive, no matter the sun conditions on the ground.

But nutritious beech buds are a favorite winter food of the white-tailed deer (Martin, Zim, and Nelson). When a deer browses on beech sprouts, the tree has to put more energy into a new sprout, or make a different bud on the sprout grow. The sprout will keep growing, unlike seedlings that have less energy and would be more likely to die if browsed heavily by deer.

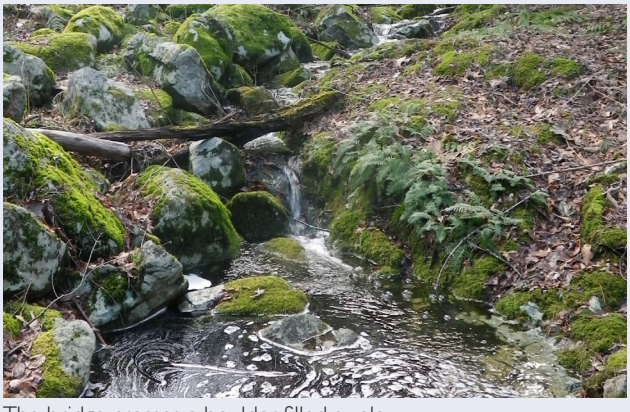
So, looking at beech sprouts can indicate deer density over the last few years. If a beech root sprout grows up straight with a single stem, you can bet there weren't many deer in the forest that year. If a sprout shows a broken, healed node, with an abrupt turn in the direction of a new bud, deer were browsing. If multiple sprouts are coming out of the same spot from the tree root, the original sprout was probably browsed. If there are multiple sprouts with many browse scars, or if all of the sprouts are eaten to the ground, then deer are heavily browsing because their population is too dense.

Sensitive Wetland Area

What there is to see:

Stepping over a rocky section of trail, we come to an attractive boulder-filled swale covered in rich mosses and ferns. A solid wooden bridge spans the swale, offering safe passage over what would be tricky footing even for the able-bodied. Standing on the bridge, if you listen carefully, you can hear water tumbling through the boulders. Overhead is a full canopy of mature hemlock trees, unique on this property.

Just to the south of the bridge, the trail wraps around a large rock outcrop that is different from the local bedrock. It appears to be a fine-grained igneous rock, rather than the coarse-grained granite that is usual in Scituate. It could be a sill, magma that injected into a crack in the existing granite and froze in place. Here is also a stone wall made from angular stones. This is a rare sight in Scituate, where old stone walls are built of rounded stones. Naturally rounded stones have been transported by water at some point in their history. Tumbling against each other in the water, any angular pieces crack off. So the angular stones on this wall have never travelled in water. Instead, they were transported by glacial ice, or they weathered from this very outcrop more recently.



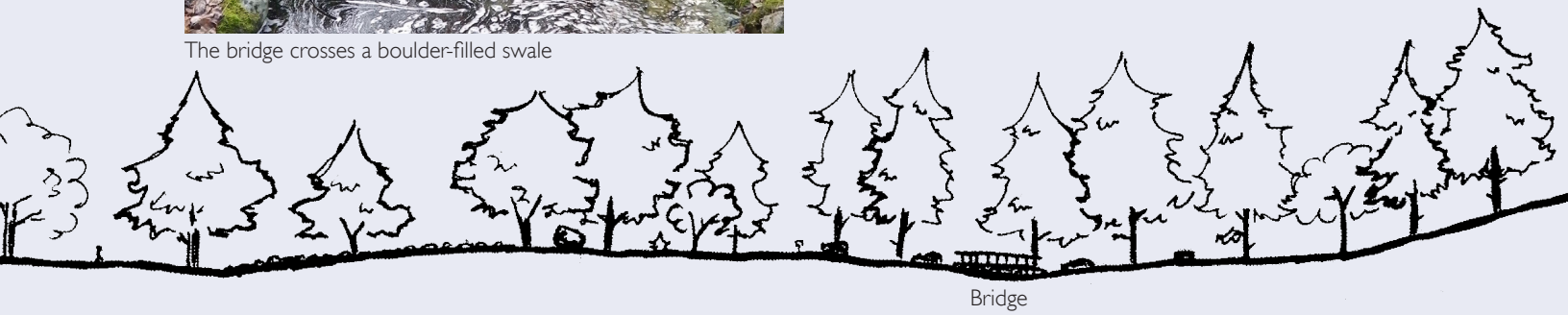
The bridge crosses a boulder-filled swale

What is missing:

Just south of the bridge, as you step around the rock outcrop, the trail becomes very wet as it skirts the stream. A set of sturdy stepping stones or a short boardwalk here would keep people's feet out of the water and preserve the quality of the stream and the trail alike. Also, why is this boulder swale here? A sign telling that story would help people to connect with the extensive geologic history of this place.

Stony wet area to the east of the bridge

Bridge built by volunteers



Bridge

A WALK DOWN MAXWELL TRAIL

Destination: Teepee Rock

What there is to see:

At the top of a short, steep slope lies the principal destination spot on the Bates Lane Area. It is Teepee Rock, a beautiful granite outcrop overlooking a lowland mixed forest. You get the quiet sense that if you sat there long enough, a pair of deer or a flock of turkeys would stroll by below.

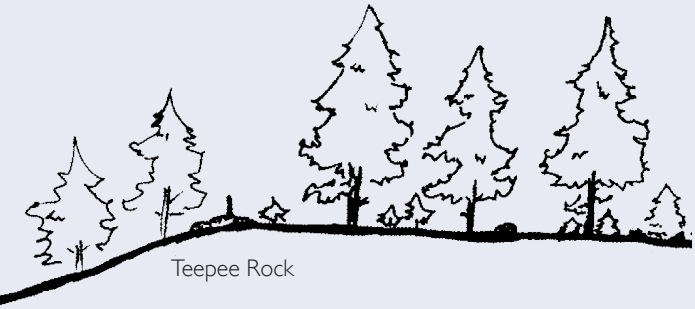
The granite at your feet has traveled far. About 550 million years ago, a piece of land split off of the supercontinent Gondwana, which included today's Africa, South America, India, Antarctica, Australia, and parts of Europe and the Middle East. That piece (Avalonia) migrated across the ancient Rheic Ocean and collided with Laurentia, today's North America. That collision and others built mountains in an event known as the Acadian orogeny, 430 million years ago ("Building New England"). Scituate's Avalon granite, on display at Teepee Rock, is a remnant of that tectonic collision.

What is missing:

While this place is lovely, it is not well cared-for by some visitors. A circular stone fire pit sits blackened by the overlook, full of litter. Both fire and litter could become problematic in this forest if left unchecked. This problem reflects a need for fire and litter policies, but also for education and increased stewardship. People who feel a responsibility for the health and beauty of the land are less likely to leave behind a mess.

Teepee Rock overlook

View from the overlook



Teepee Rock

Fire pit and trash on Teepee Rock

Patches of White Pine-Dominated Forest

What there is to see:

Beyond Teepee Rock lies a forest dominated by mature white pine trees. In large patches of the understory there are dense stands of even-aged pine saplings. Pine forests are important for red crossbills, ruffed grouse, porcupines, American robins, mourning doves, turkeys, northern bobwhite, pine grosbeaks, cottontail rabbits, and gray foxes.

Abundance of pine saplings

What's missing:

Looking around, no species of saplings other than white pine are present. The deer leave these pine saplings alone because they do not like the taste of pine. That being said, they will eat pine if they are starving — that is how we can tell that the deer population on the project site is not yet reached a dire state. In other parts of the forest, birch saplings are also untouched because deer find them distasteful. If the deer continue to browse all of the oak, beech, maple, and hemlock saplings and leave behind all of the pine and birch, the future forest will lack today's diversity.

Porcupine

Ruffed Grouse

A WALK DOWN MAXWELL TRAIL

Rock Walls Tell Stories

What there is to see:

Passing through the pine forest, we come across a rock wall, commonly seen in New England. On this property, each rock wall represents a property line or edge between different fields, a relic of past agricultural use. By the early 1800s, homesteaders had cleared the entire forest of the Bates Lane Conservation Area in order to grow crops and pasture their livestock. By the mid-1800s, however, industrial jobs lured farmers away from the land.

Abandoned, the old fields grew into pine-dominated forests with hardwoods in the understory. (At this point in history deer were rare, having been overhunted and driven from the region by deforestation. So deer were not around to eat hardwood saplings.) After a time, many landowners harvested the old-field white pines; but some folks did not, and the pines continued growing.

This history can still be seen along Maxwell Trail today. Looking at a stone wall, there is often a visible difference between how the lands on either side were managed. For instance, on the Maxwell Trail there is a spot where one landowner left the old-field white pines, which tower above us today. On the other side of the wall, the pines had been harvested and deciduous hardwoods dominate the forest there (see section illustration).

What is missing:

? There are no signs along the path to help visitors understand the patterns they are seeing in the forest. Interpretive signs strategically placed throughout the property could give people a sense of how this land has changed over time, how humans have been involved in those changes for hundreds of years, what changes we are bringing on today, and how we could be involved in the future.

Rock wall delineating old property boundaries

A FOREST MANAGEMENT PLAN CAN HELP CREATE A MORE DIVERSE AND STRATIFIED FOREST.

RECOMMENDATIONS:
MANAGING THE LANDSCAPE

Appropriate strategies consider the health of the ecosystem while maintaining a pleasant experience for all visitors. This also includes increasing safety of visitors and neighbors through education about hunting, Lyme disease, and fire safety.

MANAGE THE FOREST FOR GREATER DIVERSITY AND HEALTH

Humans have managed the forest for centuries. It is appropriate to implement a sustainable forest management plan. A professional forester should be hired to create a plan geared towards creating a healthier, more diverse habitat with minimal disturbance. There also may be opportunities to use this management plan to bring revenue to the town and attention to its local resources. Harvesting for profit should not be the guiding principle.

CONTROL DEER POPULATION

A dense deer population is over-browsing saplings and lowering forest diversity. Thus deer management and forestry must be addressed simultaneously. Hunting should be encouraged on these properties to manage deer. Due to the restrictions on hunting in the surrounding forest core and the possibility that deer may move onto the project area from nearby areas, there may need to be regional participation in creating a more effective hunting strategy.

The public should be educated about the effects of deer to garner public support for management strategies. This can be achieved with fenced deer exclosures that highlight the lack of regeneration outside of the fence. A field biologist should be brought in to help find a location and also monitor deer browsing in order to measure the effectiveness of the management strategy. If the deer population is not being effectively managed then the town should implement community hunts.

South of Appleton Fields the farmer is selectively cutting trees and the root sprouts are being heavily browsed

Other strategies include the reintroduction of natural predators and surgical sterilization of deer. However, both of these would prove unfeasible on this site. The reintroduction of predators such as the Eastern timber wolf or mountain lion would require a much larger home range area and would threaten people and pets in such a populated area. Surgical sterilization is costly and difficult to implement.

ENCOURAGE CONTROLLED HUNTING WITH ENHANCED SAFETY

There is some tension in the community surrounding hunting, with many community members saying that they do not feel safe in the forest with hunters. The recommendation for increased hunting must find a balance between managing deer populations and meeting the community need for safety. Because there is a sense in the community that many of the hunters are outsiders, the Conservation Commission should mandate that hunters get permission and are given a set of rules before hunting. This should include a pledge not to be under the influence of drugs or alcohol while hunting and a map that outlines the surrounding home buffers and indicates locations of trails.

The town should partner with the Scituate Rod and Gun club to improve safety. The club should teach the rules and post them on the kiosk at the entrance into Bates Lane Conservation Area from the club. At the other entrances hunting signs should be simple and encourage visitors to help by wearing blaze orange and putting bells on dogs. The sign should also outline that hunters have vowed not to drink, they have permission to hunt, and they provide a valuable service to the community and the forest.

If it is found that there is a lack of interest in hunting, the town should bring hunting classes to the community. They should also offer incentives to hunters, such as community service hours and rebates for meat that is donated to the local food bank.

Concise hunting sign at the entrance to Bullitt Reservation, Ashfield, MA.

EDUCATE THE PUBLIC ABOUT TICKS AND LYME DISEASE

Public education to prevent tick bites should be a primary method to reduce Lyme disease. Massachucetts' Special Commission on Lyme Disease "recommends strong emphasis and investment in education for prevention. The goal here is to provide information that will empower individuals to protect themselves and to convince them to do it" (Special Commission 15). There is not conclusive evidence that lowering the deer population, without full eradication, will substantially reduce ticks and Lyme disease. There are some experimental biological and physical methods of controlling ticks but there is no quick fix. As such, educational posters on kiosks should teach preventative measures, proper tick removal, and Lyme disease symptoms.

REDUCE RISK OF WILDFIRES

These properties appear to be at low risk of fires, but a fire manager should be hired to evaluate the risk. With changing conditions and longer periods of droughts, fire prevention and safety need to be considered.

Bates Lane should be maintained for use by fire trucks. The fire department should be notified if a gate is installed on Bates Lane.

Fires should be prohibited, and this should be clearly stated on entrance kiosks. During high drought periods there should be signs at all entrances reminding the public of the prohibition of fires and banning combustibles such as cigarettes. Also, access could be restricted during severe drought periods.

Surrounding homeowners should be educated on techniques to prevent forest fires from spreading to their homes, such as clearing debris away from their home.

Different habitats and land uses provide opportunities for conservation, expansion, and education. Struggling habitats with invasive species can be managed and improved, while sensitive habitats can be protected and enhanced. Expanding agriculture can involve more of the community and promote education.

A forest was turned into pasture at Weir Farm in Whitney-Thayer Woods.

HARVEST THE RED PINE PLANTATION

Because of the current lack of species diversity, presence of invasive species, and overall low habitat quality, it is advisable to transition the red pine plantations into a healthier, more productive habitat such as pasture or meadow. Grasslands are an underrepresented habitat in this region. Building pasture would help diversify agricultural uses and provide a sustainable method of invasive species control. Building a meadow would provide habitat to native species. If the invasive species are eradicated and grasslands require too much maintenance in the long term, the area could be transitioned into old-field successional forest habitat. (The steps of this process can be found in the Toolbox at the end of this document.)

It is important that the red pines are managed before they die so that there is economic incentive to harvest and less danger to foresters and visitors.

ACQUIRE THE SOUTH SWAMP TO PROTECT IT INTO THE FUTURE

The acquisition of the South Swamp is recommended in order to better protect the headwaters of the public water supply and sensitive habitats, including the rare natural community of Atlantic white cedar. Due to the Atlantic white cedar stand's current health, age, and regional populations, immediate management action is not deemed necessary. A field ecologist who specializes in Atlantic white cedar should be hired if the Commission decides to manage the stand for regeneration.

PROTECT CORE HABITAT

The Core Habitat area is ecologically sensitive, characterized by vernal pools, wetlands, and rare species. Disturbance in this area should be minimized by restricting activity to foot traffic.

There are opportunities to utilize Core Habitat for educational purposes by providing low disturbance access and interpretive signs.

ENCOURAGE AND EXPAND FARMING

The soil has been classified as prime farmland and could prove to be a valuable asset in food production. By reconnecting the community to their historical agricultural roots, the farm also has cultural value.

Farming should be continued with enhanced community involvement. To support additional agricultural fields and livestock, a water source should be provided. It could be a well, rainwater catchment, or a municipal supply.

Farming activity should continue to stay outside of the 100-foot protective buffer zone of the South Swamp and remain organic to reduce any impacts on the public drinking water supply.

The farm should also be used as an educational resource due to its proximity to different habitats including swamp, field, forest, and agriculture.

Zucchini and squash growing on Appleton Fields Farm (summer 2010)

OVERLOOKING A WETLAND ON LITCHFIELD TRAIL NEAR THE GRAVEL PIT

RECOMMENDATIONS:
CONNECTING HUMANS TO THE LANDSCAPE

A few changes to the site could make a more cohesive and enjoyable experience for all visitors. By maintaining trails, improving access, and connecting to the larger region, the project area can offer something for everyone to enjoy.

ENHANCE THE HUMAN EXPERIENCE

Bates Lane should be the main axis of this property because of its width and accessibility, with diverse trails radiating off to a variety of destinations that have comfortable places to sit and relax. Descriptive naming, accurate mapping, and clearly marking trails can help the user understand the different experiences the trails offer and invite further exploration.

Wetland flagging, if no longer necessary, and litter should be cleaned up in order to make visitors feel more comfortable in the forest and have a more pleasant experience.

Interpretive signs along trails explaining the land's history and ecology will help educate users, both young and old, which will create a deeper appreciation for these lands and their history.

An interpretive sign at the entrance to Bullitt Reservation gives visitors a broader perspective on regional conservation lands.

IMPLEMENT RULES TO SUPPORT HEALTHY TRAILS

The properties are mostly used by passive recreationalists and dog walkers. Based on field assessments, there does not appear to be much trail damage or erosion due to overuse except ruts on Bates Lane. To prevent further damage, motor vehicles should be prohibited by placing a gate on Bates Lane beyond the last home. To maintain a healthy trail system that is free from erosion, bikes should be restricted to Bates Lane.

MAINTAIN AND IMPROVE EXISTING TRAILS

The existing amount of trails appears to be adequate to the community's current needs. There are ample opportunities for expanding this trail system if there appears to be a need for more in the future. (This is outlined within the phases II and III of implementation.) Improving and maintaining the existing trails is a higher priority than creating new ones.

CREATE A UNIVERSALLY ACCESSIBLE TRAIL AND MITIGATE WET AREA CROSSINGS

Resources need to be guided towards trail improvements and maintenance. A universally accessible trail should help fulfill the goal from the 2000 Scituate Open Space and Recreation Plan (Horsley Witten) Americans with Disablities Act (ADA) Transition Plan. The trail runs from the southeast end of Bates Lane to the gravel pit on Litchfield Trail (shown in the Implementation section).

Wet areas on the existing trails need to be addressed. On Litchfield Trail, two wet areas need mitigation. Movable boardwalks would improve the wet meadow at Litchfield's southern entrance. A bridge or boardwalk would bring people safely over the stream crossing in the Core Habitat.Natural Heritage and Endangered Species Program (NHESP) should be consulted in constructing this stream crossing. Other wet areas that need mitigation are shown in the Implementation section, and techniques are in the Toolbox.

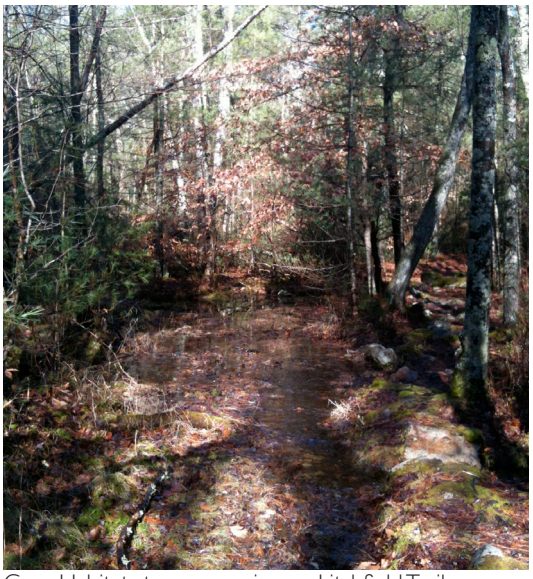
IMPROVE WAY-FINDING STRATEGIES

To help visitors find their way, give trails descriptive names, provide accurate maps, and blaze trails clearly. Also, improving Bates Lane to provide a strong axis through the property will create an understandable pattern of trails for visitors to explore.

Kiosk at entrance to Litchfield Trail


Wet areas and ruts along Bates Lane


Soggy meadow entrance on Litchfield Trail


Core Habitat stream crossing on Litchfield Trail

PROVIDE BETTER ACCESS TO THE SITES

Bates Lane Conservation Area needs an official, clearly designated parking lot. A parking lot off Bates Lane at the Carl Pipes trailhead, on an area that is flat, dry, tangled with briars and not ecologically sensitive, will provide a main access point for vehicles from the south. It should be usable by visitors with limited mobility. Having it located at the Carl Pipes trailhead will accentuate one of the main intersections of the site, making way-finding easier with two distinct directions that the user can choose from.

A new clearly designated access point should be opened, if feasible, at the intersection of Bates Lane and Indian Wind Drive. This will provide on-street parking and an access point from the north. This access point is already utilized by many local users, but a kiosk with maps and rules will better serve the larger community.

To promote hunting and increase safety there should be a kiosk and access point placed at the Rod and Gun Club entrance point at the end of Carl Pipes Trail. Signs there should explain hunting rules and regulations.

It is also necessary to create a driveway into the Crosbie-Appleton property and create a small parking lot that will serve the needs of visitors and farmers. This can be sited within the red pine plantation because it is a not very diverse habitat and is out of the wetland buffer zone. This will allow for the parking lot to be expanded if more visitors or student groups want to access the property.

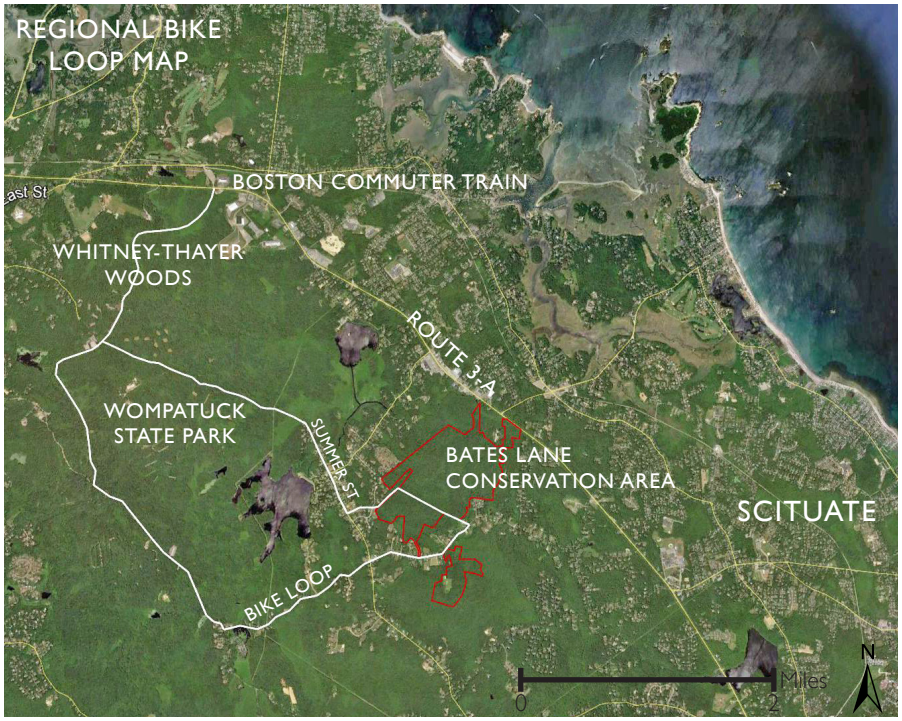
The new access points should all have legible roadside signs to direct people to these entrances. The driveway and parking lots must consider drainage and run-off mitigation to protect the surrounding wetland habitats and prevent erosion. If possible the driveway and parking lots should be built using permeable materials, such as gravel.

The official access points should include the following: kiosk (design in Toolbox), educational and way-finding tools, trashcan, dog waste bags, and bike rack.

CONNECT REGIONAL RECREATION

The project area is part of a larger forest core that offers differing habitats and recreational uses. There is an opportunity to connect multiple open spaces through a ten-mile bike loop traversing Bates Lane, through Wompatuck State Park, and continuing to the Boston commuter train on the rail-trail in Whitney-Thayer Woods. These roads and trails are already in place. This forest loop would need a collaborative effort to create maps and signs, make northern Wompatuck more inviting, and place bicycle safety signs on some of the roads.

This loop may help create an understanding that preserving and utilizing these open spaces is in everyone's interest and goes beyond political boundaries, enabling a broader collaboration for ecological health. In the future there may be an opportunity to begin to connect these spaces with ecological corridors as well, allowing movement for mammals with larger home-range needs.



A ten-mile bike loop can connect Bates Lane to Wompatuck, Whitney-Thayer Woods, and the Boston commuter train.

Entrance to the Whitney-Thayer Woods rail-to-trail spur

A VIEW DOWN BATES LANE

IMPLEMENTATION

A prioritized implementation plan ties together the management and site design recommendations.

Phase I includes the minimum necessary steps the Commission should perform. After the first phase is completed, the Commission should reassess the need for further improvements.

Phases II and III expand trails, access, parking, and educational and farming opportunities as appropriate with increased demand. The ecological health of the project area must be reassessed with every new phase to ensure that it is not being harmed by overuse.

As they move into the future, the Commission and the community should work together to fulfill the needs of the people and the ecosystem using these implementation phases.

The recommendations of Phase I are...

- To mitigate high priority wet area crossings
- To create a universally accessible trail segment
- To provide better access and parking
- To display clearer, more informative signs
- To protect and enhance habitats
- To maintain visitor safety
- To encourage farming at Appleton Fields

The recommendations of Phase II are...

- To expand the trail system without crossing wetlands
- To mitigate all existing wetland crossings
- To connect universally accessible trails into a loop
- To educate visitors about ecology and history
- To create more parking and access points
- To expand educational opportunities on the farm

The recommendations of Phase III are...

- To expand the trail system even more
- To continue to develop universally accessible trails
- To provide easier access for the greater region
- To make the farm into an agricultural and educational resource center

Gravel pit along Litchfield Trail

PHASE I

BRING TOGETHER ECOLOGICAL MANAGEMENT AND RECREATION

The trail network remains largely as it is today with adjustments to accommodate visitors with limited mobility, control recreational uses and enhance overall experience.

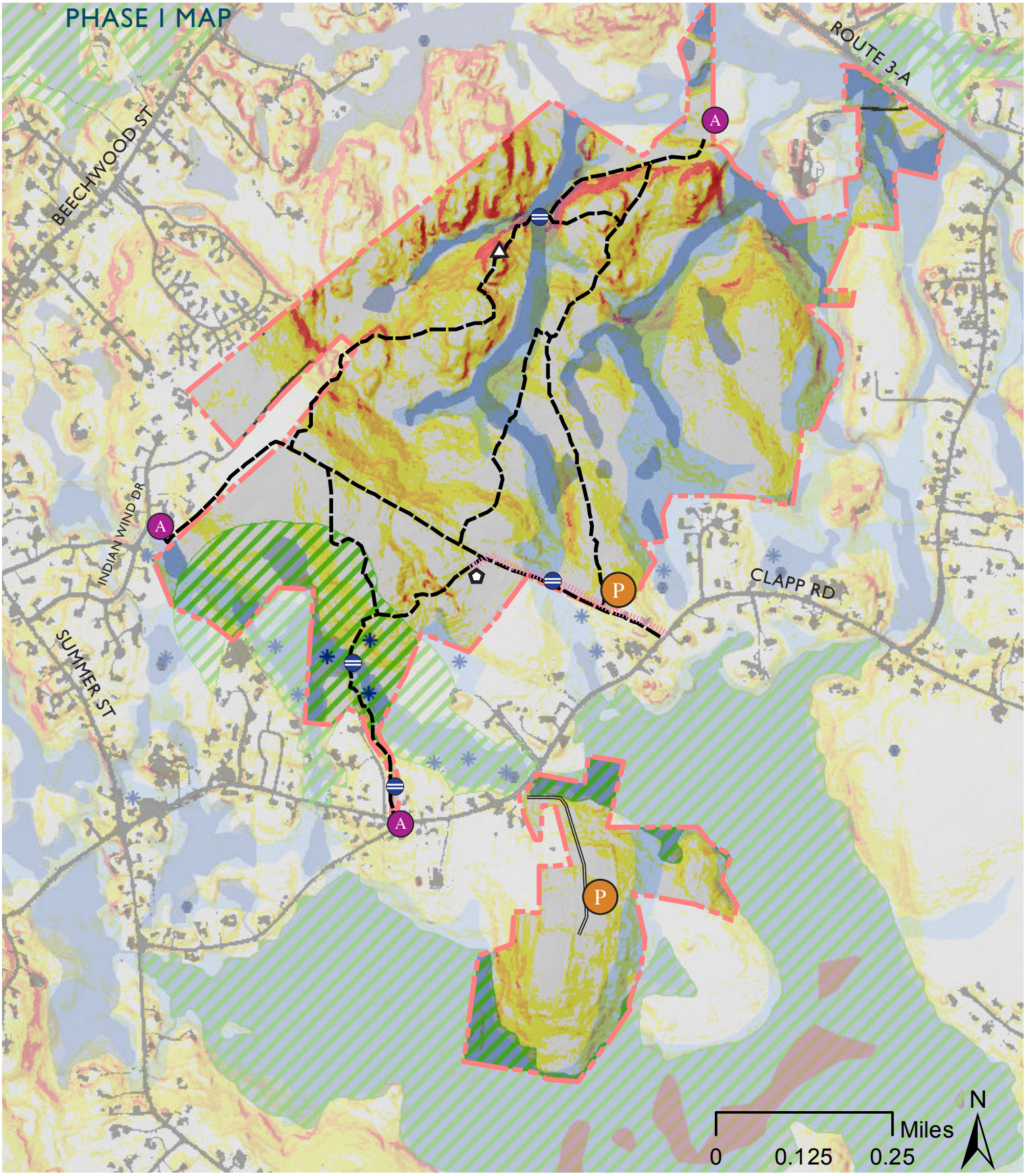
- Bates Lane and Litchfield Trail provide universally accessible trail to the gravel pit.
- Adjustments are made to the gravel pit to make it a more satisfying and accessible destination.
- Water crossings are built and wet areas are mitigated on the Litchfield Trail and Bates Lane to maintain accessibility and protect wetlands.
- Benches are placed along the trail at appropriate places for resting and viewing.
- Wetland flagging and litter are cleaned up to improve the human experience.
- A gate is placed after the last home on the southeast end of Bates Lane to prevent personal vehicle access.

Parking and access points are expanded to provide clear and sufficient entry for the larger community. Kiosks and amenities introduce visitors to the site.

- A parking lot is added on Bates Lane at the Carl Pipes trailhead with universally accessible spots.
- A driveway is built through the Crosbie Family Preserve to Appleton Fields Farm with a small parking lot among the red pines.
- Signs on Clapp Road direct visitors onto the properties.
- A clearly designated access point is placed at the intersection of Bates Lane and Indian Wind Drive.
- A kiosk providing hunting buffer maps and explaining hunting rules is placed at the northeast end of Carl Pipes Trail for visitors entering from the Rod and Gun Club.
- All main access points include a kiosk, hunting sign, trash can, dog waste bags, and a bike rack.

New policies and management strategies are put into place in order to maintain a healthy ecosystem and give the visitor a sense of safety.

- Dogs must be leashed or within voice command so they do not disturb wildlife and sensitive habitats or intimidate other visitors.
- Bikes are restricted to Bates Lane so they do not harm trails or ecosystems.
- Hunting with enhanced safety is encouraged to effectively manage deer populations. To hunt these lands hunters must get permission from the Conservation Commission. Clear signs help educate visitors about hunting rules and safety.
- A field biologist monitors the impacts of deer browse on forest health and indicates good places to build deer exclosures for regeneration and education.
- A forester develops a Forest Management Plan, which primarily focuses on forest health and diversity.
- A fire manager assesses the current risk of fire within the forest.
- Invasive species are managed throughout the properties to minimize their spread.
- A water source is developed on Appleton Fields Farm to encourage farming.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Potential Vernal Pools
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Frequent Ponding
Atlantic White Cedar
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Parking and Access
Access
Wet Area Mitigation
Current Trail
Proposed Driveway
Universally Accessible
Teepee Rock
Gravel Pit

PHASE II

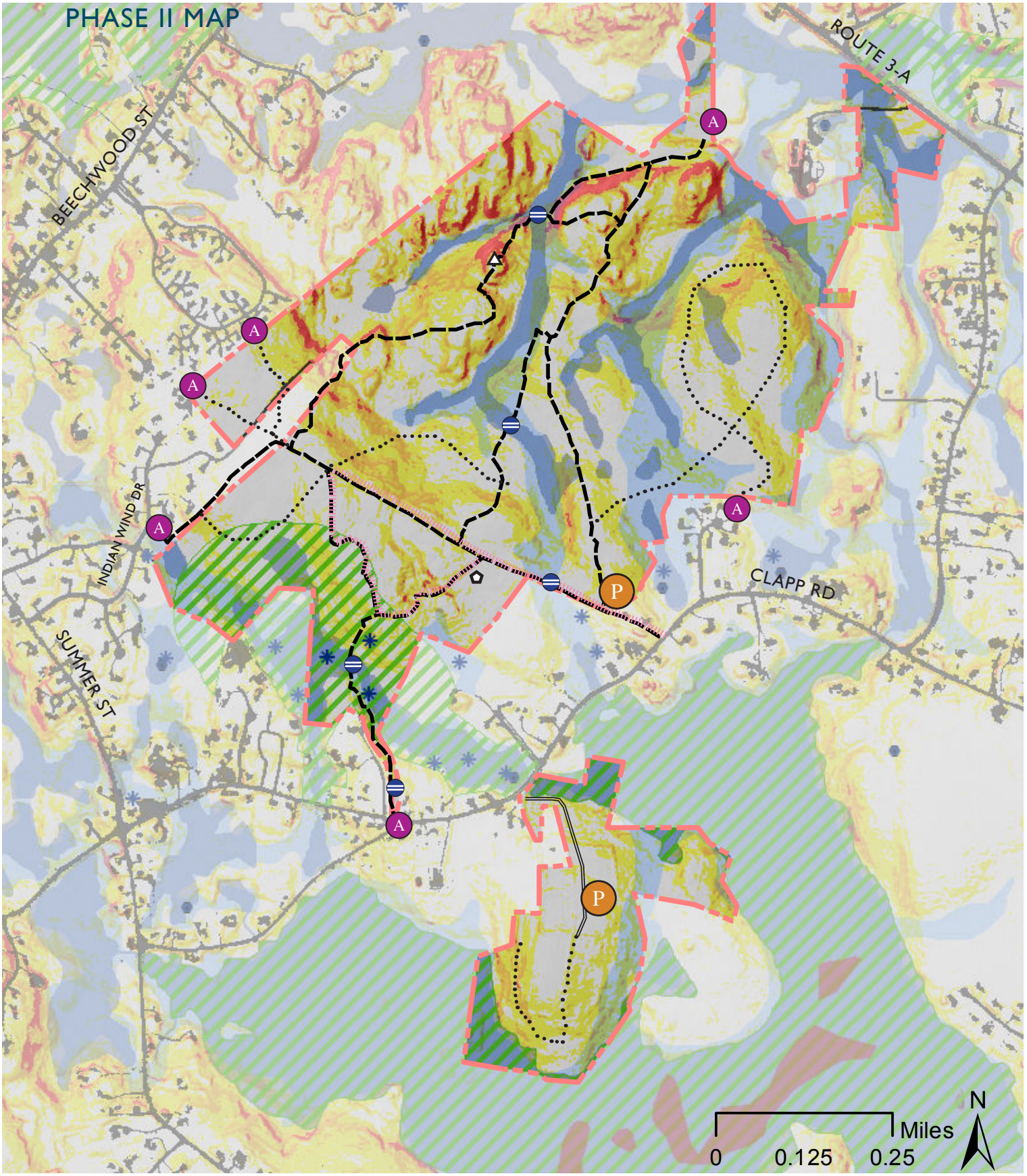
EXPAND EDUCATION AND RECREATION

The trail network expands into new areas but avoids new wetland crossings. Some current trails are altered for universal accessibility.

- A universally accessible loop connects Bates Lane and Litchfield Trail to Horse Trail.
- Six new trails on Bates Lane Conservation Area bring visitors into the eastern region and connect to new access points.
- A new trail south of Appleton Fields skirts the edge of the South Swamp.
- A water crossing is built on New Trail.
- Interpretive signs along trails educate visitors about ecological and historical patterns.

Parking is expanded and new access points and facilities are built in order to provide greater entry for the larger community and opportunities for educational uses.

- Three new access points provide entry from neighborhoods to the east and west.
- The Crosbie-Appleton parking lot expands into the old red pine plantation to include school bus parking.
- A pavilion built next to the farm serves many functions, such as a space for a classroom, picnics, vegetable cleaning, and small farmer's market.
- Composting toilets next to the farm accommodate farmers, school groups, and other visitors.
- The red pines are harvested to create pasture or meadow habitat.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Wet Area Mitigation
Current Trail
Proposed Trail
Proposed Driveway
Universally Accessible
Boardwalk
Teepee Rock
Gravel Pit

PHASE III

CONNECT TO THE GREATER REGION

The trail network is expanded into more areas of the site and provide more universally accessible trails.

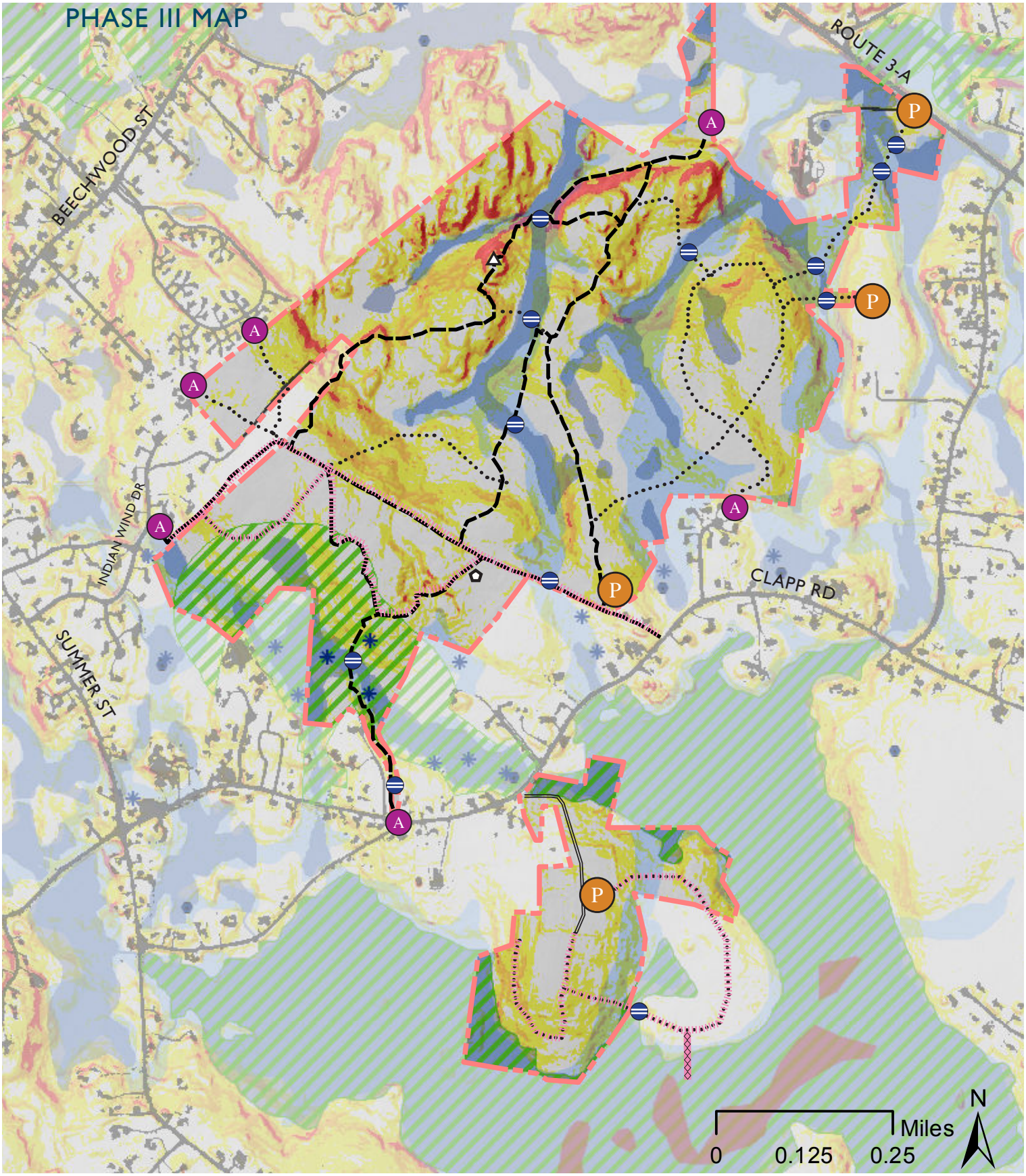
- More trails are made universally accessible including the entire length of Bates Lane and all trails on Crosbie-Appleton.
- A new educational trail with a boardwalk to the Atlantic white cedar stand reaches into the South Swamp from Crosbie-Appleton.
- Appropriate wetland crossings are built on all new trails.

Access points surround Bates Lane Conservation Area with more parking and signs to entice new visitors.

- Two new parking lots are added on Bates Lane Conservation Area to provide increased access from the east at Holly Crest Road and on the main road Route 3-A.

Crosbie-Appleton becomes a regional resource for farming and education.

- Atlantic white cedars are managed for regeneration in consultation with an ecologist.
- Appleton Fields Farms becomes a community agricultural resource center, providing education, resources, and tools.
- Educational opportunities on Crosbie-Appleton are expanded to include ecology and land management, as well as agriculture.


PHASE III MAP
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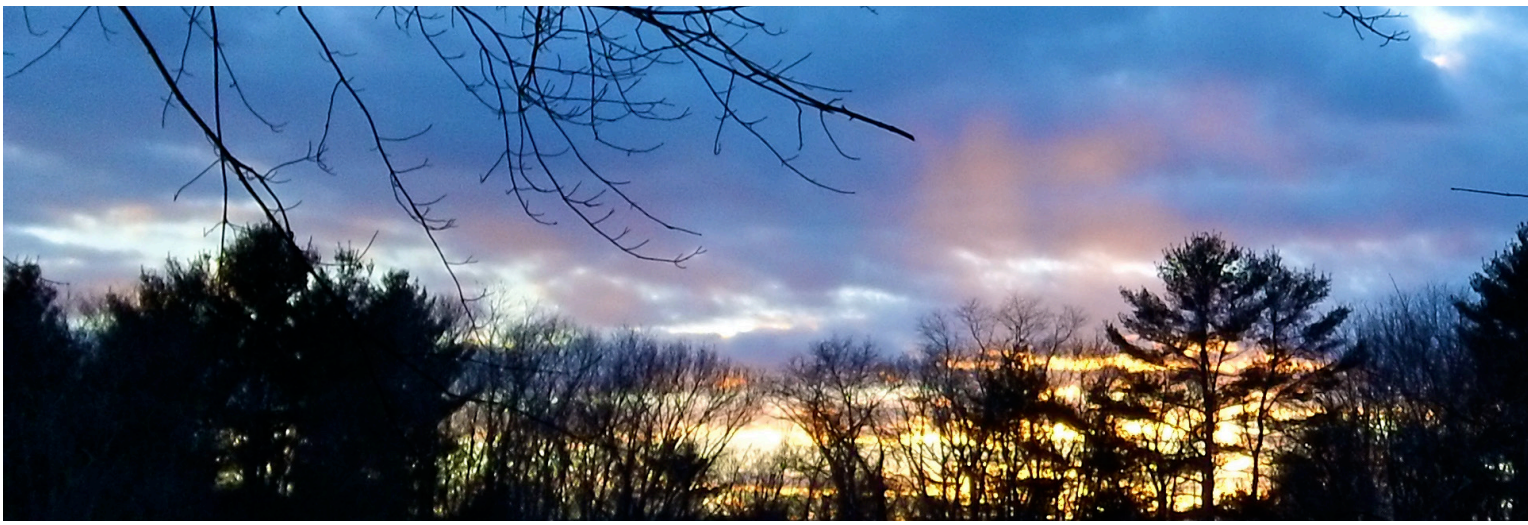

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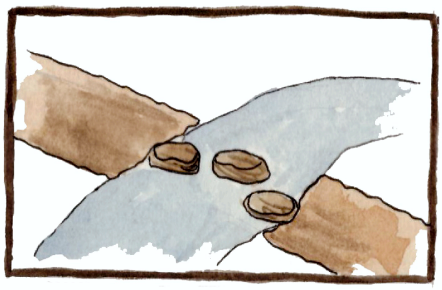
PHOTO CREDITS

All photos are taken by the Conway Team (Anna Best, Emily Durost, Noah Zimmerman) unless otherwise noted.
Page 35 - Right: Vincent Bucca
Page 45 - Right: Vincent Bucca
Illustrations by Emily Durost

Sunset over Appleton Fields Farm

TOOLBOX:
TRAILS OVER WET AREAS

Stepping Stones



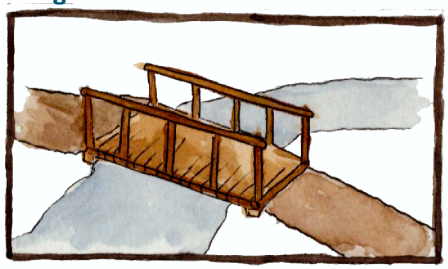
Pros

- Least environmental impact
- Best for shallow streams with light to moderate flow
- Minimizes bank disturbance and silt loading
- Could use stones from site or from a local source

Cons

- Large stones difficult to move into site
- Unsteady or slippery stones could be dangerous
- Most stones onsite are round not flat--may not be suitable
- Not universally accessible

Bridges



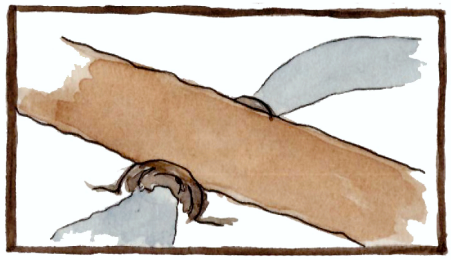
Pros

- Wood could be cut from onsite and milled locally
- Can be made universally accessible
- Visually appealing

Cons

- Requires maintenance over the years
- Can be expensive
- Must design for largest potential stream flow
- Requires consultation with engineer

Culverts



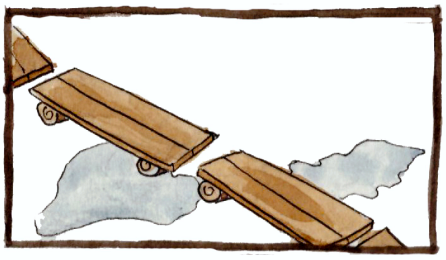
Pros

- Can be universally accessible
- Less expensive than bridge
- Low maintenance

Cons

- Requires disturbance and alteration of stream bed
- Requires regular removal of debris from culvert
- Must design for largest potential stream flow
- Less visually appealing than bridge

Movable Boardwalks



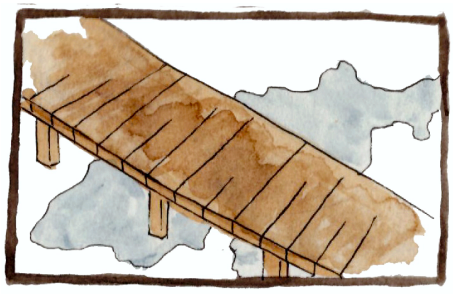
Pros

- Simple design and construction
- Seasonally movable
- Movable for mowing
- Ideal for wet meadows

Cons

- Not universally accessible
- Inappropriate for flooded or rocky areas
- Casts shade that kills vegetation beneath
- Less stable than permanent boardwalks

Boardwalks



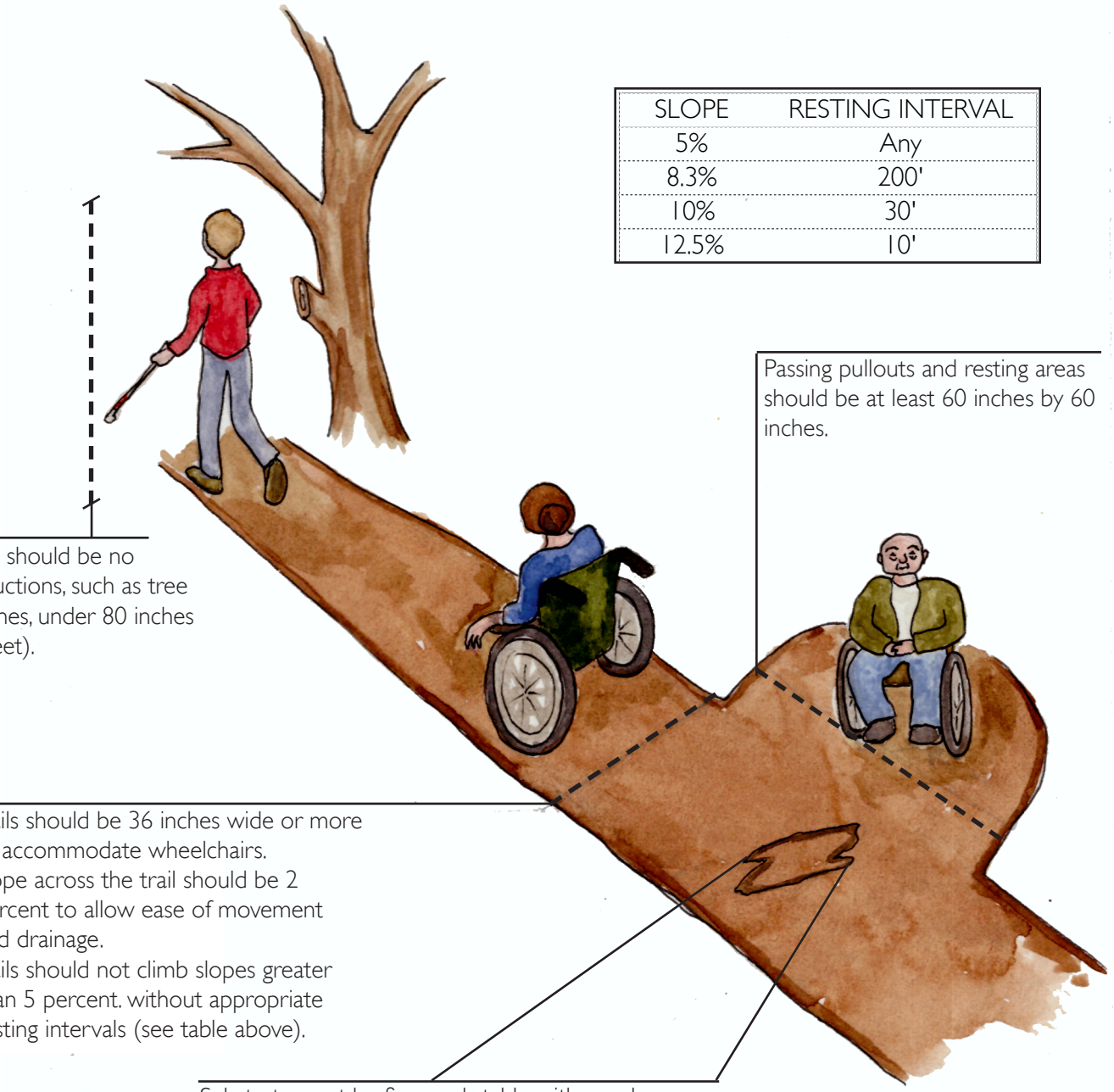
Pros

- Ideal for broad wetland areas
- Fixed in place, so withstands flooding
- Universally accessible with design standards available

Cons

- Requires digging to sink pilings
- Requires pressure-treated or rot-resistant wood
- Requires maintenance over the years

TOOLBOX:
UNIVERSALLY ACCESSIBLE TRAILS



SLOPE	RESTING INTERVAL
5%	Any
8.3%	200'
10%	30'
12.5%	10'

There should be no obstructions, such as tree branches, under 80 inches (6.5 feet).

Passing pullouts and resting areas should be at least 60 inches by 60 inches.

- Trails should be 36 inches wide or more to accommodate wheelchairs.
- Slope across the trail should be 2 percent to allow ease of movement and drainage.
- Trails should not climb slopes greater than 5 percent. without appropriate resting intervals (see table above).

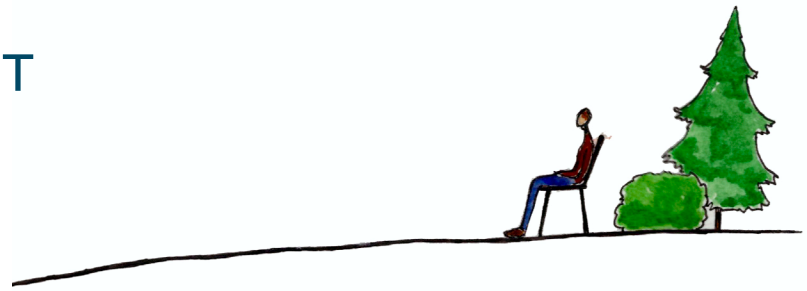
Substrate must be firm and stable with good drainage. Tread obstacles, such as roots or small rocks, cannot exceed 2 inches in height.

GENERAL TRAIL CRITERIA

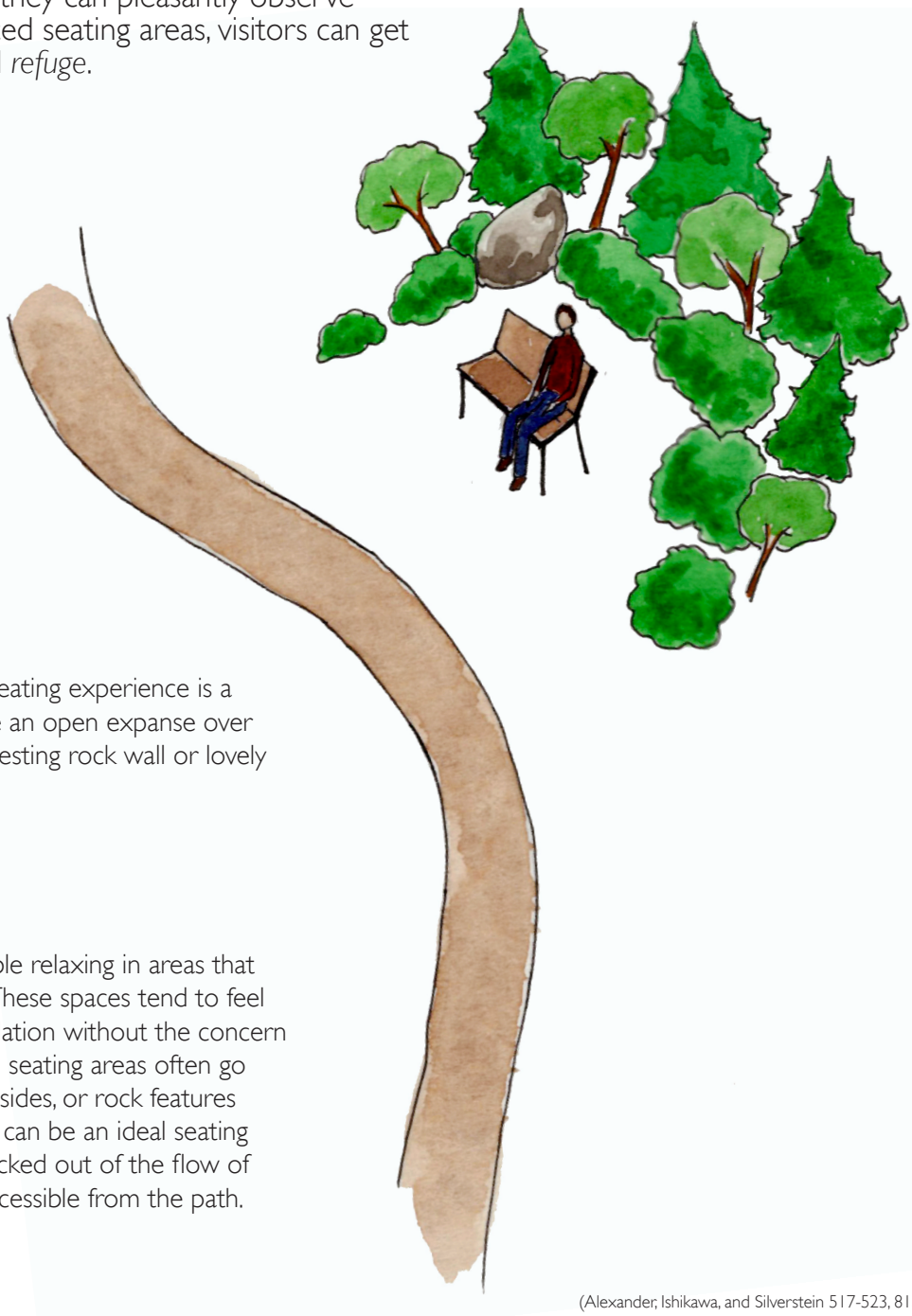
TYPE OF TRAIL	SURFACE	WIDTH	LONGITUDINAL SLOPE	CROSS SLOPE
Universally Accessible	soil/gravel/wood chips	≥ 36" (with passing areas)	0-5%	2%
Walking	soil/stairs	18"-30"	0-8%	2-4%
Hiking	soil/stairs	18"-30"	0-25%	2-4%

(Adapted from *Trail Planning*)

TOOLBOX:
BENCH PLACEMENT



Benches and seating areas have in important role in how people experience an area. It is essential to give people a place to rest, but it is just as crucial to give them a space in which they can pleasantly observe nature. In properly placed seating areas, visitors can get a sense of *prospect* and *refuge*.



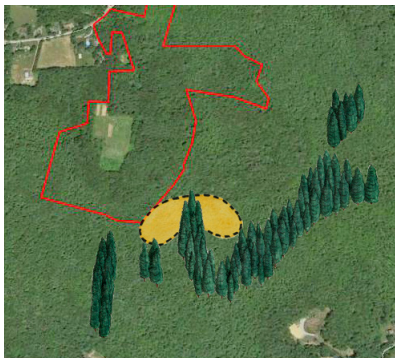
Prospect
An important part of the seating experience is a pleasant view. This could be an open expanse over a lookout or facing an interesting rock wall or lovely tree.

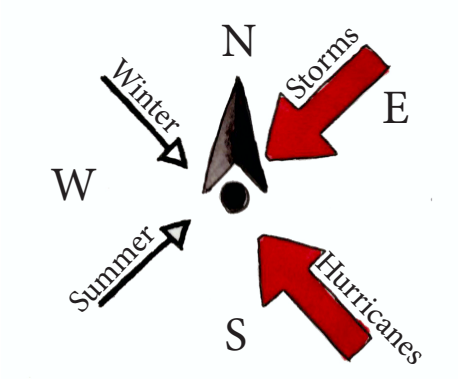
Refuge
People feel most comfortable relaxing in areas that are enclosed from behind. These spaces tend to feel safe and allow for contemplation without the concern of being disturbed. Exposed seating areas often go unused. Dense plantings, hillsides, or rock features that create a concave nook can be an ideal seating area. This spot should be tucked out of the flow of movement but still easily accessible from the path.

(Alexander, Ishikawa, and Silverstein 517-523, 815-817)

TOOLBOX:
ATLANTIC WHITE CEDAR MANAGEMENT

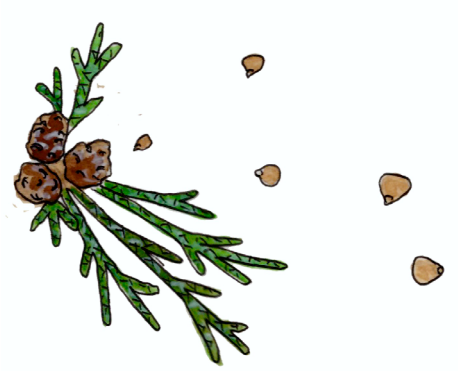
Successfully regenerating Atlantic white cedar in an area, such as within the yellow zone on the map to the right, involves selecting a manageable patch near, but not immediately adjacent to the existing cedar stand. This area is clear-cut to maximize sunlight and prevailing winds are relied upon for natural seed dispersal.





Wind Direction

As a general pattern for eastern Massachusetts, summer winds blow from the southwest and winter winds from the northwest. Stronger weather events such as hurricanes and storms tend to arrive from the southeast and northeast, respectively. When clearing an area for regeneration management, it is important not to leave the existing stand exposed to the stronger winds from hurricanes and storms that may cause blow-downs, or ice from the winter winds which may damage branches.
Atlantic white cedar seeds are dispersed in fall when winds blow towards the northwest. When considering the site location, an area towards the northwest of the existing stand will allow for natural seed dispersal.



Seed Dispersal

Atlantic white cedar produces small cones that house tiny, winged seeds that are dispersed on the wind. These seeds are very small and can travel long distances in a strong wind. In a good year, one acre of Atlantic white cedar can produce eight to nine million seeds. These seeds can remain dormant in the leaf litter for many years, awaiting the right conditions.

Maintenance

Atlantic white cedars require open sunlight to germinate and grow, which means that they can be easily out-competed by surrounding species such as red maple. In order to aid the regeneration of Atlantic white cedar, competing species should be thinned or entirely removed. The area chosen for management should be fenced-in to prevent deer from browsing on the young saplings. Deer preferentially browse on cedar in winter when food is scarce.

(Motzkin, "Plant Fact")

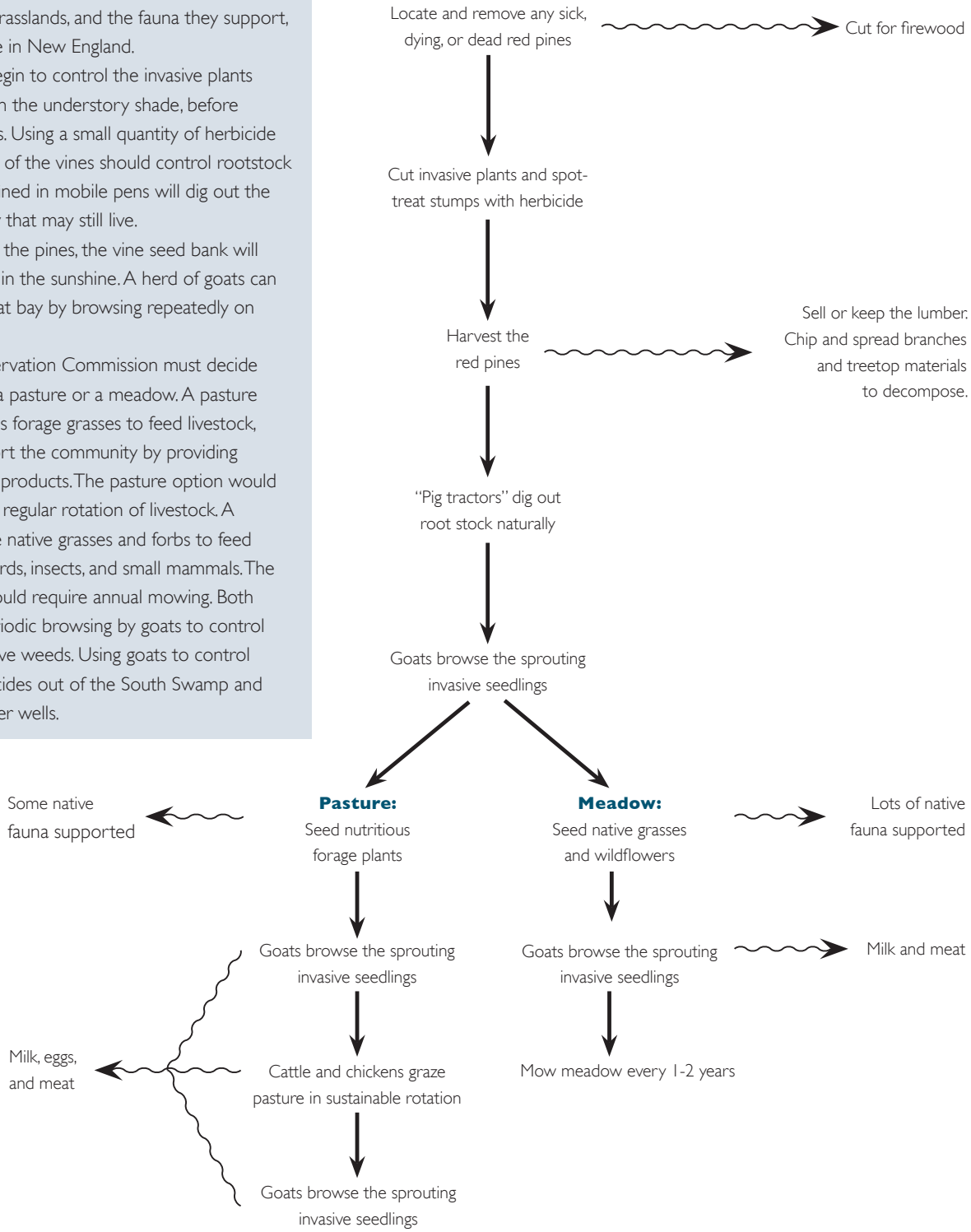
TOOLBOX:
TRANSITION FROM RED PINE PLANTATIONS

Aggressive vines have invaded the red pine plantations, which provide little habitat to native species. Harvesting the pines will open up an opportunity for a grassland habitat. Grasslands, and the fauna they support, are increasingly rare in New England.

It is critical to begin to control the invasive plants while they are still in the understory shade, before harvesting the pines. Using a small quantity of herbicide to treat the stumps of the vines should control rootstock sprouting. Pigs confined in mobile pens will dig out the roots, removing any that may still live.

After harvesting the pines, the vine seed bank will begin to germinate in the sunshine. A herd of goats can keep the seedlings at bay by browsing repeatedly on broadleaf weeds.

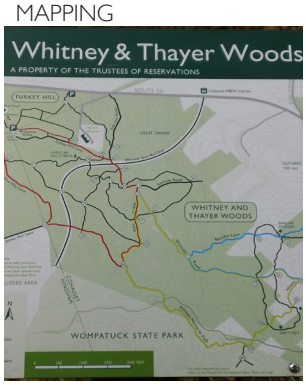
Then the Conservation Commission must decide whether to create a pasture or a meadow. A pasture would use nutritious forage grasses to feed livestock, which would support the community by providing local meat or dairy products. The pasture option would require fencing and regular rotation of livestock. A meadow would use native grasses and forbs to feed and house native birds, insects, and small mammals. The meadow option would require annual mowing. Both options require periodic browsing by goats to control the broadleaf invasive weeds. Using goats to control weeds keeps herbicides out of the South Swamp and out of drinking water wells.



TOOLBOX:
COMPREHENSIVE SIGNS

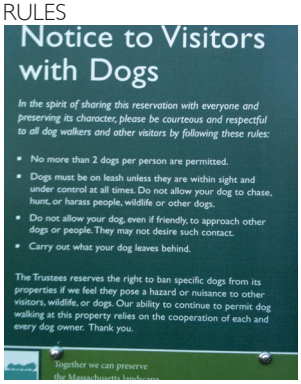
INFORMATION

MAPPING



ACTIVITIES

RULES



EDUCATION

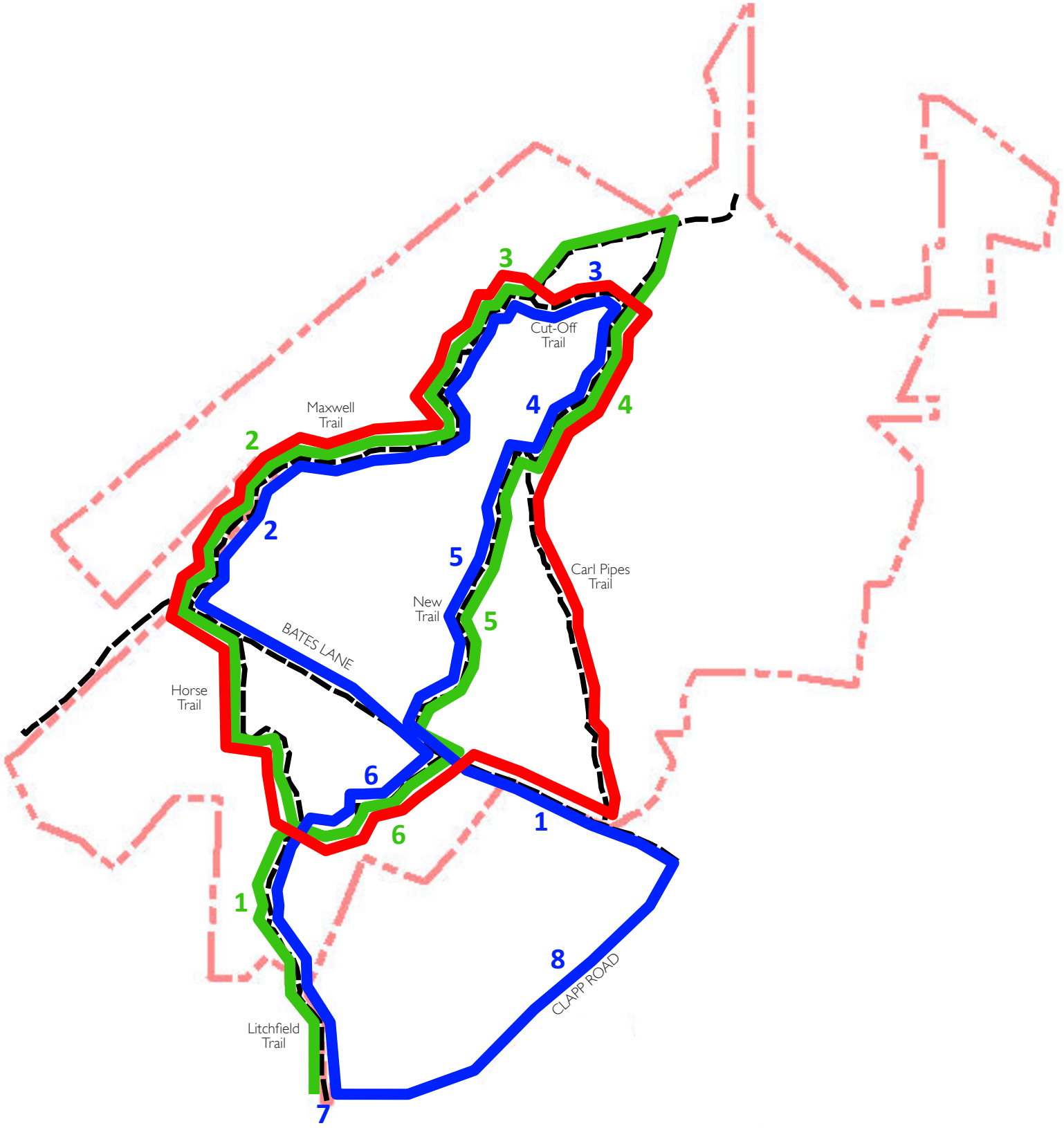
Lyme Disease Association

BOUNDARIES

INTERPRETATION

From the Bullitt Reservation

TOOLBOX:
THEMED LOOP TRAILS



History Loop

1 Historical Bates Lane
2 Old pasture's watering hole
3 Old foundation
4 Historical Carl Pipes Trail
5 Old outhouse
6 Old gravel pit
7 Mt. Hope Improvement Society
8 Many old homes, including Clapp House

Consult with Historical Society for interpretive information and material.

Ecology Loop

1 Vernal pools
2 Maxwell Trail shifts from one forest type to another
3 Boulder swale with mature hemlocks and different rock types
4 Huge 10x20' boulder left by glacier
5 Wetlands with sphagnum moss
6 Forest succession and wetlands in old gravel pit

Exercise Loop

Distance: 2 miles
Elevation gain: 193 feet
Maximum slope up: 25.5%
Maximum slope down: -21.4%
Average slope up: 3.0%
Average slope down: -4.3%

APPENDIX:
MAP DATA ATTRIBUTION

Unless otherwise indicated, the maps in this document are for planning purposes only. These maps were created using data from multiple sources. These include:

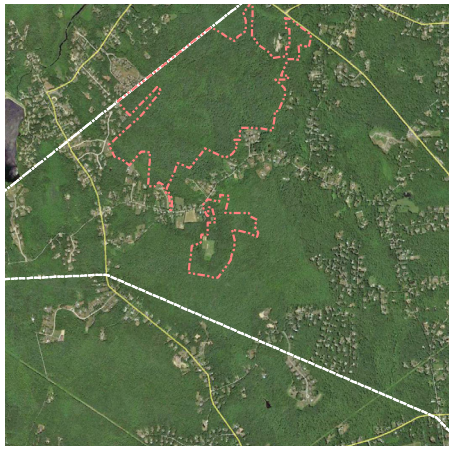
MassGIS. Office of Geographic Information, Commonwealth of Massachusetts, Information Technology Division

USDA NRCS Geospatial Data Gateway

Google Earth

Town of Scituate. IT Director. Bill Sheehan

Data created or processed by Conway School Team:
Anna Best, Emily Durost, and Noah Zimmerman



PROJECT AREA MAP

Context Section, Page 6

Base map of project area and town boundaries.

DATA SOURCES

MassGIS

- Town Boundaries. Towns_MA_2008. Accessed 1/13

Google Earth

- Aerial Photo. Accessed 3/13

Conway Team

- Project Area Boundary. Created 1/13

REGIONAL OPEN SPACE MAP

Ecological Patterns Section, Page 9

Regionally protected open space in perpetuity

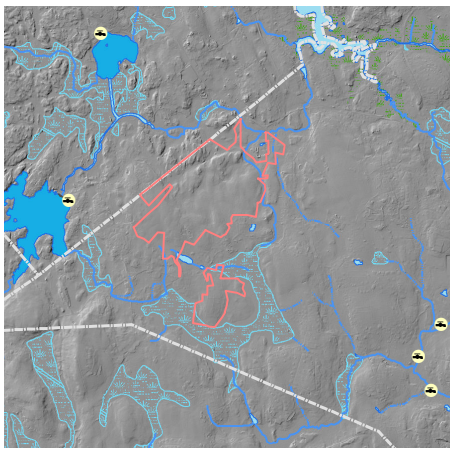
DATA SOURCES

MassGIS

- Open Space. Protected and Recreational OpenSpace. Accessed 3/13
- Town Boundaries. Towns_MA_2008. Accessed 1/13
- Aerial Photo. Ortho_Imagery. Accessed 1/13

Conway Team

- Project Area Boundary. Created 1/13



DRAINAGE MAP

Ecological Patterns Section, Page 10

Drainage patterns and public drinking water supplies.

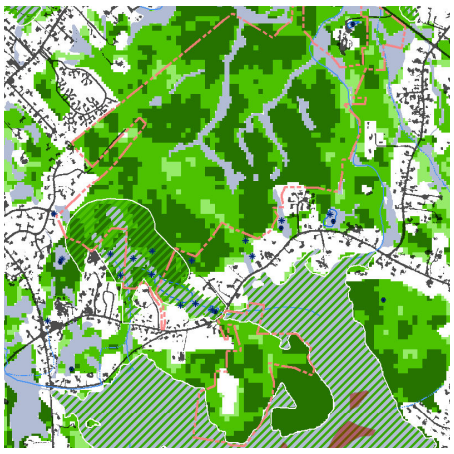
DATA SOURCES

MassGIS

- Town Boundaries. Towns_MA_2008. Accessed 1/13
- Hydrography. Hydro_2009 (25K). Accessed 2/13
- Public Water Supply Stations. DEP_BWP_Major_Facilities. Accessed 2/13

Conway Team

- Project Area Boundary. Created 1/13
- Hill Shade from National Elevation Data Set (3 meter). Processed 1/13



ECOLOGICAL SUMMARY MAP

Ecological Patterns Section, Page 11

Summary map of the ecological patterns on the project area.

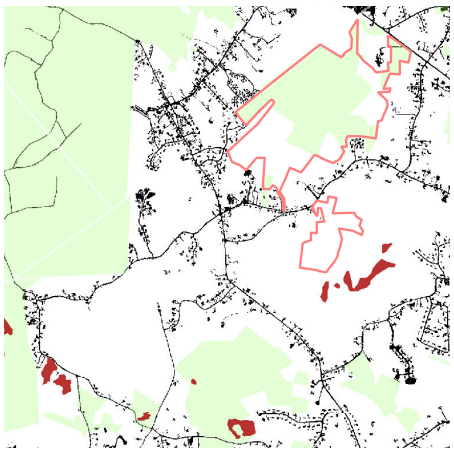
DATA SOURCES

MassGIS

- Welands. DEP_Wetlands. Accessed 2/13
- Upland Forest. GISDATA_VCFOREST. Accessed 2/13
- Impervious Surface. imp_ne5. Accessed 2/13
- NHESP Certified Vernal Pools. CVP_PT. Accessed 1/13
- NHESP Potential Vernal Pools. GISDATA_PVP_PT. Accessed 1/13
- BioMap Core Habitat. BM2_CORE_HABITAT. Accessed 2/13
- Acidic Peatland Community Systems. vcpeatp1. Accessed 2/13
- Hydrography. Hydro_2009 (25K). Accessed 2/1

Conway Team

- Project Area Boundary. Created 1/13



REGIONAL ATLANTIC WHITE CEDAR MAP

Ecological Patterns Section, Page 14

Regionally protected Atlantic white cedar stands.

DATA SOURCES

MassGIS

- Impervious Surface. imp_ne5. Accessed 2/13
- Open Space. Protected and Recreational OpenSpace. Accessed 3/13
- Acidic Peatland Community Systems. vcpeatp1. Accessed 2/13

Conway Team

- Project Area Boundary. Created 1/13

1831 MAP

Human Patterns Section, Page 18

Historical map of project area from 1831 showing forest cover and development.

DATA SOURCES

Conway Team

- Project Area Boundary. Created 1/13
- Historical 1831 Map. MATWN_3764_S322_1831_R6. Processed 2/13

PARCEL LINES AND UPLAND FOREST MAP

Human Patterns Section, Page 19

Project area with parcel lines and upland forest types.

DATA SOURCES

MassGIS

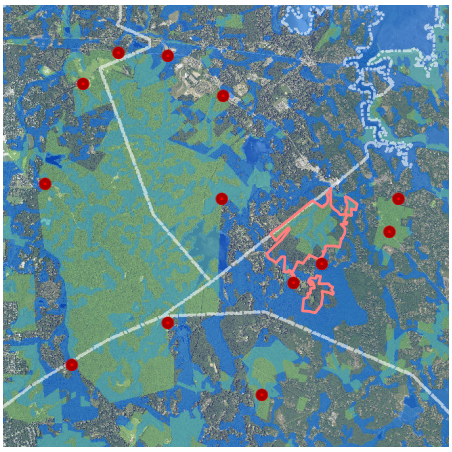
- Town Boundaries. Towns_MA_2008. Accessed 1/13
- Upland Forest. GISDATA_VCFOREST. Accessed 2/13
- Aerial Photo. Ortho_Imagery. Accessed 1/13

Town of Scituate

- Parcels. Parcels. Accessed 1/13

Conway Team

- Project Area Boundary. Created 1/13



ACCESS AND OPEN SPACE MAP

Human Patterns Section, Page 22

Regional recreation and access points.

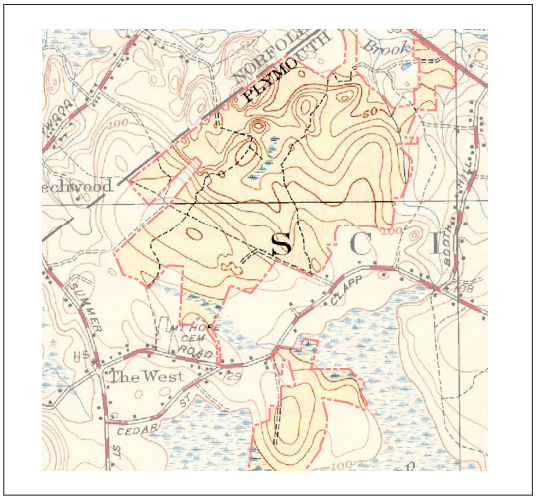
DATA SOURCES

MassGIS

- Open Space. Protected and Recreational OpenSpace. Accessed 3/13
- Town Boundaries. Towns_MA_2008. Accessed 1/13
- Aerial Photo. Ortho_Imagery. Accessed 1/13
- Welands. DEP_Wetlands. Accessed 2/13

Conway Team

- Project Area Boundary. Created 1/13
- Regional Open Space Access Points. Created 3/13



HISTORICAL TRAILS AND ACCESS MAP

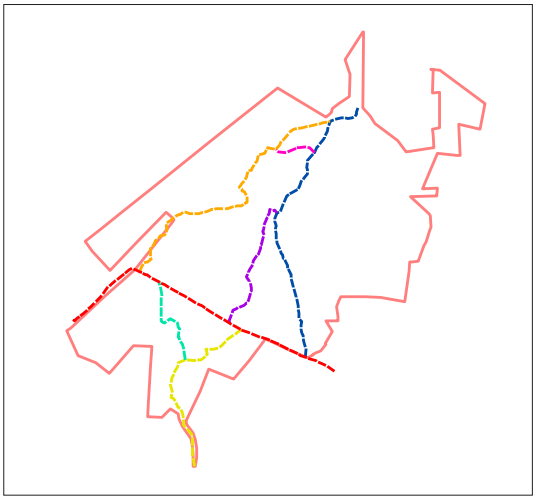
Human Patterns Section, Page 23

Trails and access in 1940's.

DATA SOURCES

Conway Team

- Project Area Boundary. Created 1/13
- Historical Map Georeferenced from USGS 1948 Contour Map. Processed 2/13



TRAIL MAP

Human Patterns Section, Page 25

Current trail map of Bates Lane Conservation Area

DATA SOURCES

Conway Team

- Project Area Boundary. Created 1/13
- Trails mapped by GPS. Created 1/13

HUNTING BUFFER MAP

Human Patterns Section, Page 26

Five hundred foot buffers around structures and prohibited east of Route-3A

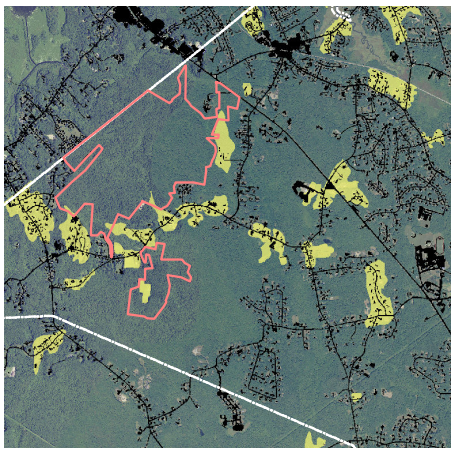
DATA SOURCES

MassGIS

- Town Boundaries. Towns_MA_2008. Accessed 1/13
- Aerial Photo. Ortho_Imagery. Accessed 1/13

Conway Team

- Project Area Boundary. Created 1/13
- Hunting buffer from MassGis Structures. Created 3/13



PRIME FARMLAND MAP

Human Patterns Section, Page 27

Much of the region's prime farmland is developed or forested.

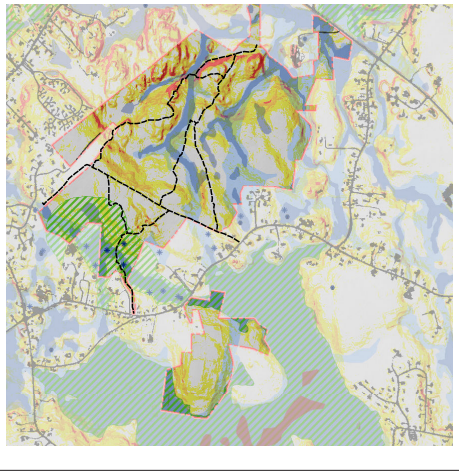
DATA SOURCES

MassGIS

- Town Boundaries. Towns_MA_2008. Accessed 1/13
- Impervious Surface. imp_ne5. Accessed 2/13
- Aerial Photo. Ortho_Imagery. Accessed 1/13

Conway Team

- Project Area Boundary. Created 1/13
- Prime farmland created using Soil Data Viewer and layer. soi_plymth. Processed 2/13



SITE DESIGN MAP

Implementation Section, Page 45-47

Summary map to aid in site design.

DATA SOURCES

MassGIS

- NHESP Certified Vernal Pools. CVP_PT. Accessed 1/13
- NHESP Potential Vernal Pools. GISDATA_PVP_PT. Accessed 1/13
- Welands. DEP_Wetlands. Accessed 2/13
- Impervious Surface. imp_ne5. Accessed 2/13
- BioMap Core Habitat. BM2_CORE_HABITAT. Accessed 2/13
- Acidic Peatland Community Systems. vcpeatp1. Accessed 2/13

Conway Team

- Project Area Boundary. Created 1/13
- Frequent Ponding created using Soil Data Viewer and layer. soi_plymth. Processed 2/13
- Slopes from National Elevation Data Set (3 meter). Processed 1/13

APPENDIX:
RARE SPECIES DATA RELEASE

Commonwealth of Massachusetts

Division of Fisheries & Wildlife

Wayne F. MacCallum, *Director*

February 14, 2013

Noah Zimmerman
Conway School of Planning
322 South Deerfield Road
P.O. Box 179
Conway, MA 01341

Re: Data Release
North and south of Clapp Road - Scituate, MA
NHESP Tracking Number: 13-31896

Dear Mr. Zimmerman,

Thank you for submitting a Natural Heritage Data Release Form to the Massachusetts Natural Heritage and Endangered Species Program of the MA Division of Fisheries & Wildlife. Our database indicates that the following MESA-listed species have been found in the vicinity of the site:

North of Clapp Road:

Scientific Name	Common Name	Taxonomic Group	MESA Status	Last Observation Year
Hemidactylium scutatum	Four-toed Salamander	Amphibian	delisted in 2008	2002
Terrapene carolina	Eastern Box Turtle	Reptile	Special Concern	2002
Rumex verticillatus	Swamp Dock	Vascular Plant	Threatened	2002

South of Clapp Road:

Scientific Name	Common Name	Taxonomic Group	MESA Status	Last Observation Year
Clemmys guttata	Spotted Turtle	Reptile	delisted in 2006	2001
Terrapene carolina	Eastern Box Turtle	Reptile	Special Concern	2002

www.nhesp.org

Natural Heritage & Endangered Species Program
100 Hartwell St., Suite 230, West Boylston, MA 01583 **Tel:** (508) 389-6360 **Fax:** (508) 389-7890

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This evaluation is based on the most recent information available in the NHESP database, which is constantly being expanded and updated through ongoing research and inventory.

For any additional questions regarding this data release, please contact (508) 389-6362.